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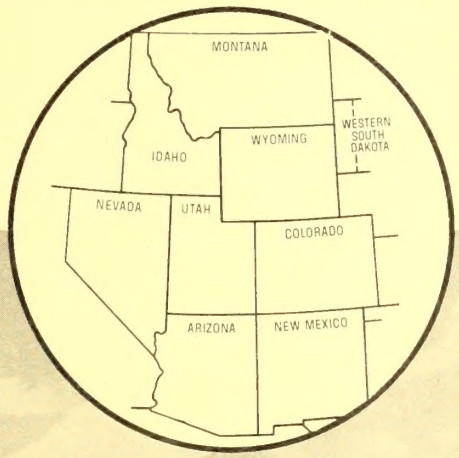

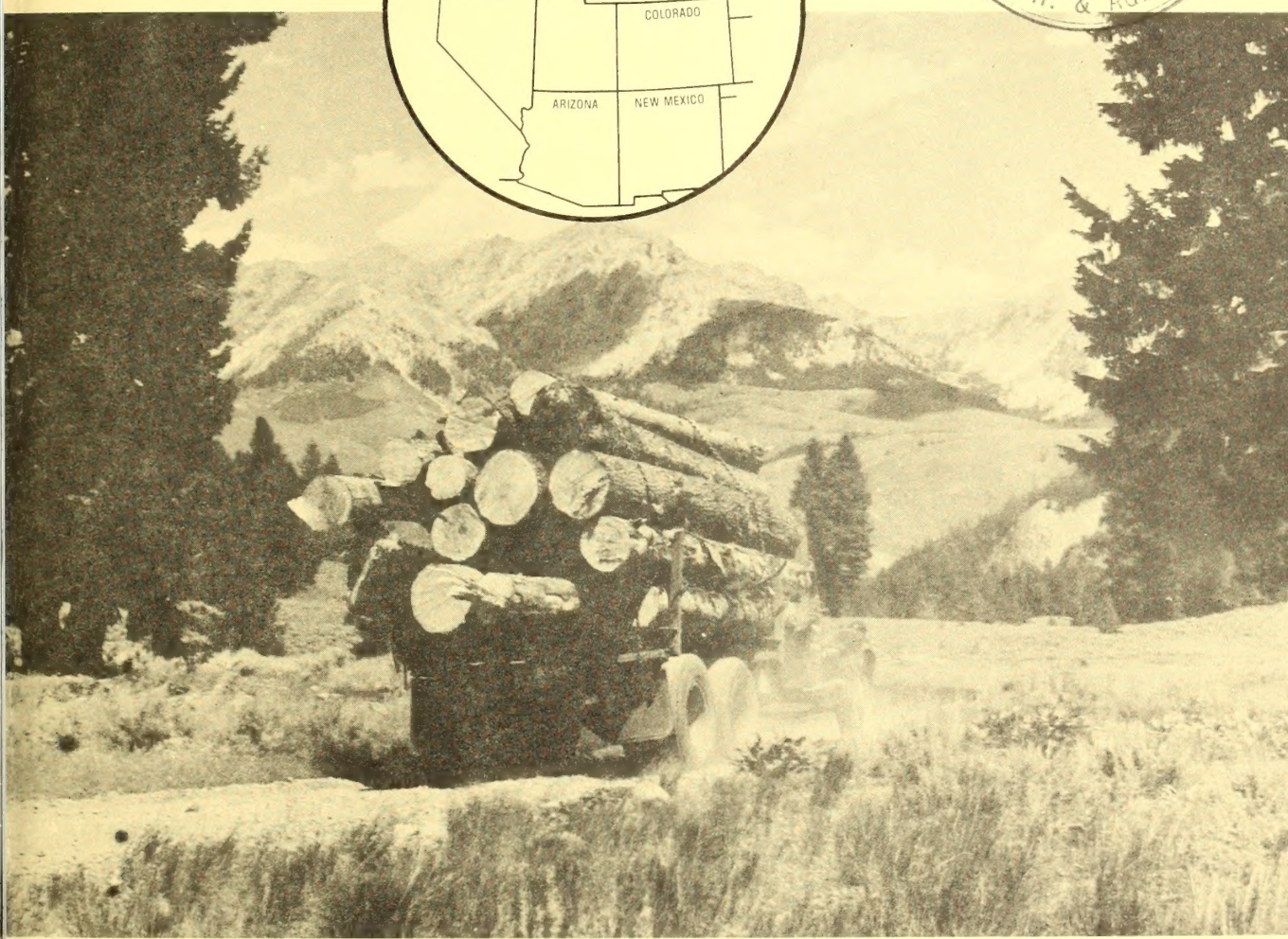

USDA Forest Service
Resource Bulletin INT-9, 1970

INTERMOUNTAIN FOREST & RANGE EXPERIMENT STATION
Ogden, Utah 84401

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*The Forests of Wyoming	Resource Bulletin INT-2	1963
*The Forest Resources of Colorado	Resource Bulletin INT-3	1964
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Output of Timber Products in Idaho, 1962	Research Paper INT-13	1964
*Timber Products Output in Colorado, Wyoming, and Western South Dakota, 1962	Research Paper INT-14	1964
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TIMBER PRODUCTS IN THE ROCKY MOUNTAIN STATES, 1966

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and

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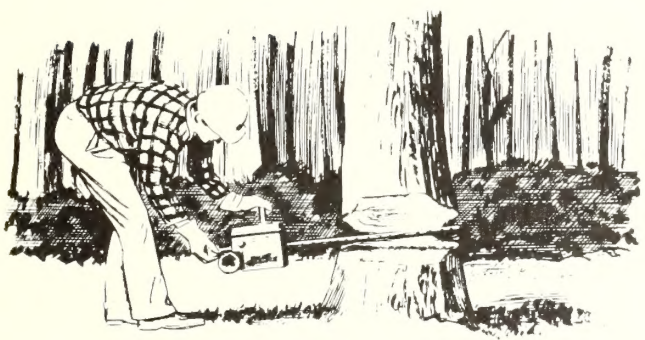

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
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ABSTRACT

Reports findings of the second comprehensive survey of output of timber products in the Rocky Mountain States. Presents statistics on production of saw logs, veneer logs, pulpwood, and various other roundwood products by States and land ownership classes. Also shows saw-log production by county and volumes of plant byproducts and plant residues. Makes comparisons with 1962 output and indicates trends since 1952. Estimates are given of total removals from growing stock and sawtimber in 1966.

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FOREWORD

This report summarizes information resulting from a survey of the 1966 output of timber products in the Rocky Mountain States.[1] The survey was conducted in 1967 by the Forest Survey Project of the Intermountain Forest and Range Experiment Station, USDA Forest Service, as part of the continuing nationwide Forest Survey.

In addition to providing estimates of roundwood production from timberlands in each State, statistics are given on the following: number of sawmills, veneer and plywood plants, and papermills; volumes of plant byproducts and plant residues; interstate movement of roundwood; lumber production (U.S. Bureau of the Census estimates); and total removals from growing stock inventory.

Data for previous years and in trend discussions and comparisons came from a number of publications. Information for 1962 came largely from three sources: "Timber Resources and Industries in the Rocky Mountain States" (Wilson and Spencer 1967);[2] "Timber Trends in the United States" (U.S. Forest Service 1965); and a series of reports published in 1964 (Wilson, Spencer, and Spencer and Farrenkopf). A report "The Economic Importance of Timber in the United States" (Hair 1963) provides data for 1954 and 1958. "Timber Resources for America's Future" (U.S. Forest Service 1958) was the source of most of the 1952 information. A few other publications of lesser significance were used as sources of information on individual products in specific States and for certain years. Most of these publications have not been referenced in this report.

Definitions of terms, survey methods, and reliability of estimates are presented in Appendix A. Appendix B contains tables and maps showing location of active mills, and output of saw logs by production classes from individual counties.

[1] *The following are called Rocky Mountain or Mountain States in this report: Idaho, Montana, South Dakota (west of the 103d meridian), Wyoming, Arizona, Colorado, Nevada, New Mexico, and Utah.*

[2] *Names and dates in parentheses refer to Literature Cited, p. 44.*

THE ROCKY MOUNTAIN STATES

Roundwood products output continues to rise in Rocky Mountain States

The volume of roundwood timber products harvested in the Rocky Mountain States in 1966 totaled 810 MMCF. This is an increase of 25 percent since 1962, and 79 percent since 1952. These products include saw logs, veneer logs, round pulpwood, commercial poles, mine timbers, miscellaneous industrial wood (principally house logs, shingle bolts, and specialty logs), posts, fuelwood, and farm timbers (U.S. Bureau of Census 1967).

Saw logs are still dominant but proportion in other products is increasing

Significant differences have occurred among individual products with respect to trends in recent years. Although output of all major products has increased, some have gone up substantially, others very little. Saw logs have maintained their predominance over the period 1952-66 and in 1966 accounted for 80 percent of the roundwood volume (figure 1). However, since 1962 the total volume of other products has increased to a greater extent and, as shown in table 1, nearly all products have experienced a much greater percentage increase than have saw logs.

The big increase in veneer-log output primarily reflects the capacities of four new plants — one in Colorado, two in Idaho, and one in Montana. In 1952, only 8.9 MMBF[3] of veneer logs were produced.

Diversification of product harvest from timberlands within the Mountain States has occurred much more rapidly in some States than others. And, as shown (page 2), New Mexico is the only State in which an increase since 1962 did not occur in the proportion of total output comprised of products other than saw logs.

[3] *International 1/4-inch log rule is used throughout this report for board-foot volumes of roundwood. Lumber production is expressed in board feet lumber tally.*

Table 1. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	3,819,900	4,138,719	8
Veneer logs	Thousand board feet	129,684	474,508	266
Pulpwood	Thousand standard cords	242	286	18
Commercial poles[1]	Thousand pieces	428	738	72
Posts	Thousand pieces	3,373	5,817	72
Mine timbers	Thousand cubic feet	3,170	6,882	117
Miscellaneous industrial wood[2]	Thousand cubic feet	2,996	2,449	−18
Miscellaneous farm timbers	Thousand cubic feet	6,009	9,488	58
Fuelwood	Thousand standard cords	257	359	40
All products	Thousand cubic feet	649,598	809,792	25

[1] *Includes a small amount of piling.*

[2] *Includes products such as house logs, converter poles, shingle bolts, excelsior bolts, match stock, charcoal wood, and similar items.*

State	Percentage of output in products other than saw logs	
	1962	1966
Idaho	6	18
Montana	12	18
Western South Dakota	42	56
Wyoming	6	19
Arizona	24	31
Colorado	13	23
Nevada	52	99
New Mexico	22	17
Utah	10	14
Mountain States	12	20

Saw log exports from the Rocky Mountain States in 1966 totaled about 3 MMBF. This volume went mainly to Washington.

Forty-six percent of roundwood products came from ponderosa pine and Douglas-fir

Ponderosa pine, followed closely by Douglas-fir, was the most important species for roundwood products harvested in the Rocky Mountain area (figure 2). Ponderosa pine was the leading species in Arizona, New Mexico, western South Dakota, and Utah; Douglas-fir was the most important species in Idaho and Montana. Engelmann spruce led in Colorado, and lodgepole pine in Wyoming. The 1966 product harvest from Nevada came mainly from pinyon pine and juniper cut for fuelwood and posts.

There has been no significant change in relative importance of species since 1962. However, some changes in relative proportions have occurred since 1947.[4] As illustrated in figure 3, ponderosa pine remains predominant and Douglas-fir has substantially increased its hold as the second-place species. Engelmann spruce and the true firs have improved their positions while western white pine and western larch have become relatively less significant.

[4] *Although data are not available for 1947 roundwood volume by species, lumber production statistics for that year are considered closely indicative of the species breakdown of saw logs, and have provided the basis for proportioning 1947 saw-log volume for figure 3.*

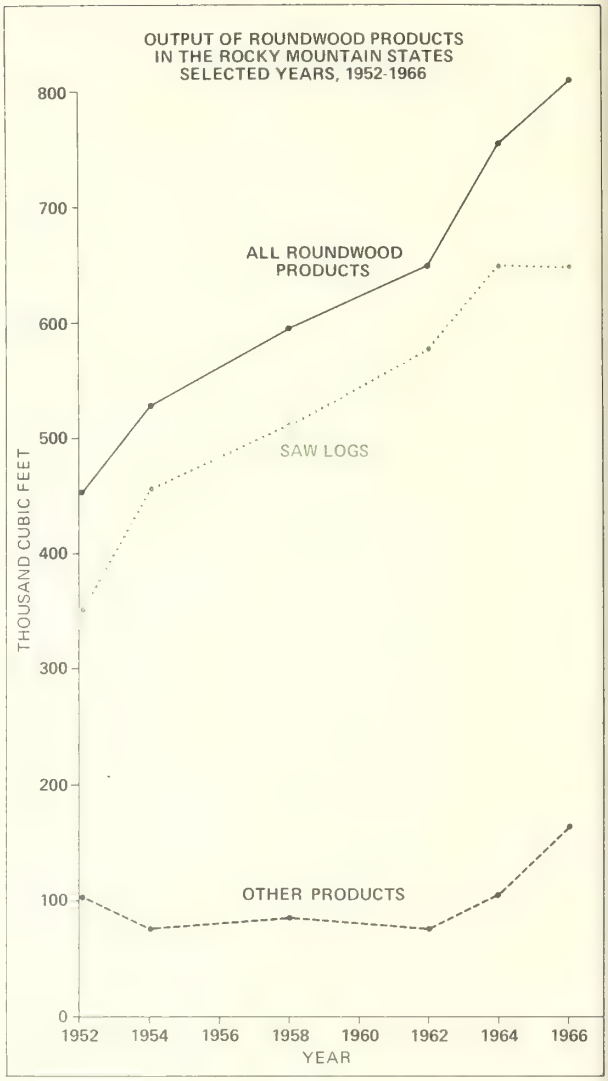


Figure 1

Public lands supplied 74 percent of roundwood timber products in 1966

National Forests were the prime source of timber products in all the Rocky Mountain States except Nevada and accounted for 63 percent of all roundwood products in 1966; in 1962 National Forests provided 57 percent (figure 4). In Colorado, Utah, and Wyoming, National Forests supplied over 90 percent of the roundwood timber products in 1966. In all nine States the proportion of products supplied by National Forests increased since 1962. Other public lands contributed 11 percent in 1966, the same proportion as in 1962.

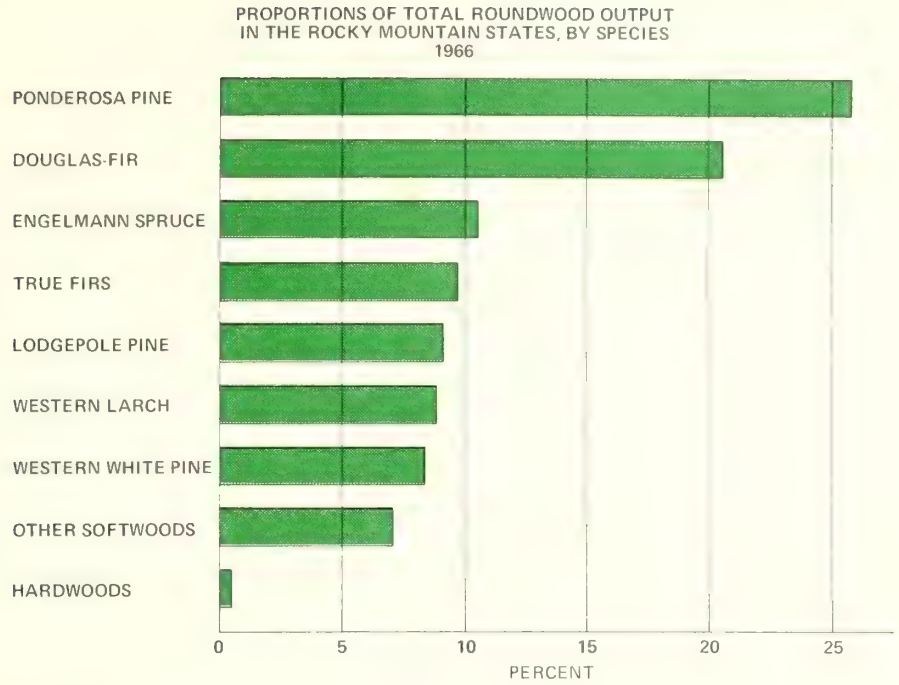
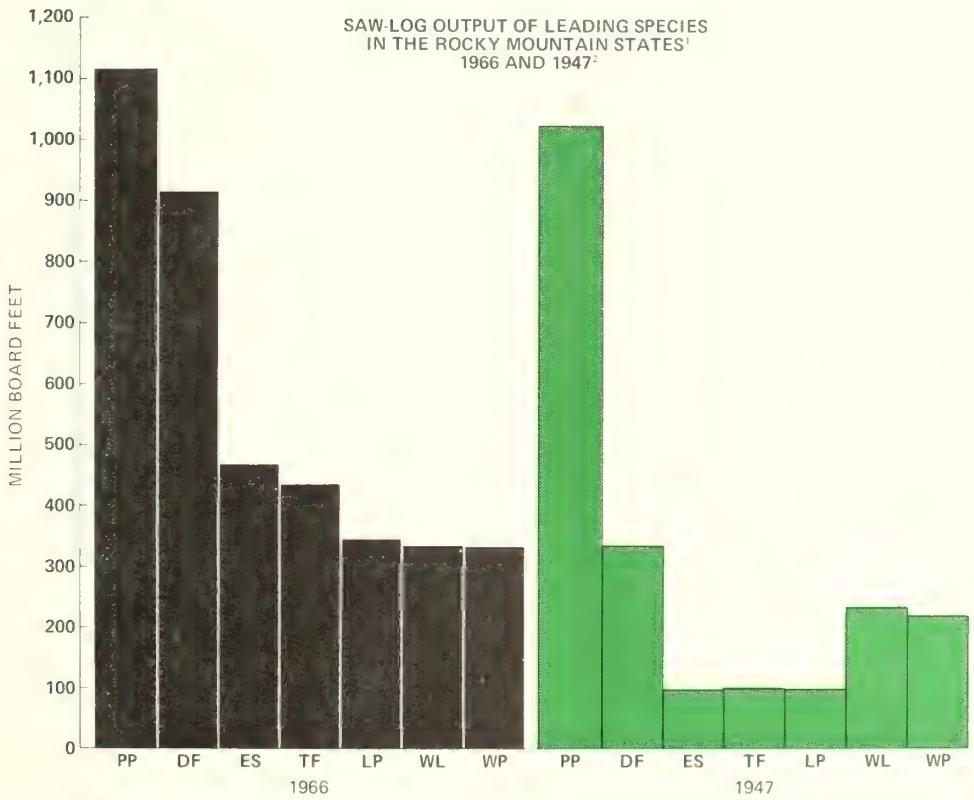


Figure 2



[1] *Nevada not included*
[2] *Lumber production, 1947 Census of Manufactures, MC24A, Table 6-F*

Figure 3

CUBIC FOOT VOLUME OF ROUNDWOOD PRODUCTS BY OWNERSHIP CLASS IN THE ROCKY MOUNTAIN STATES, 1966

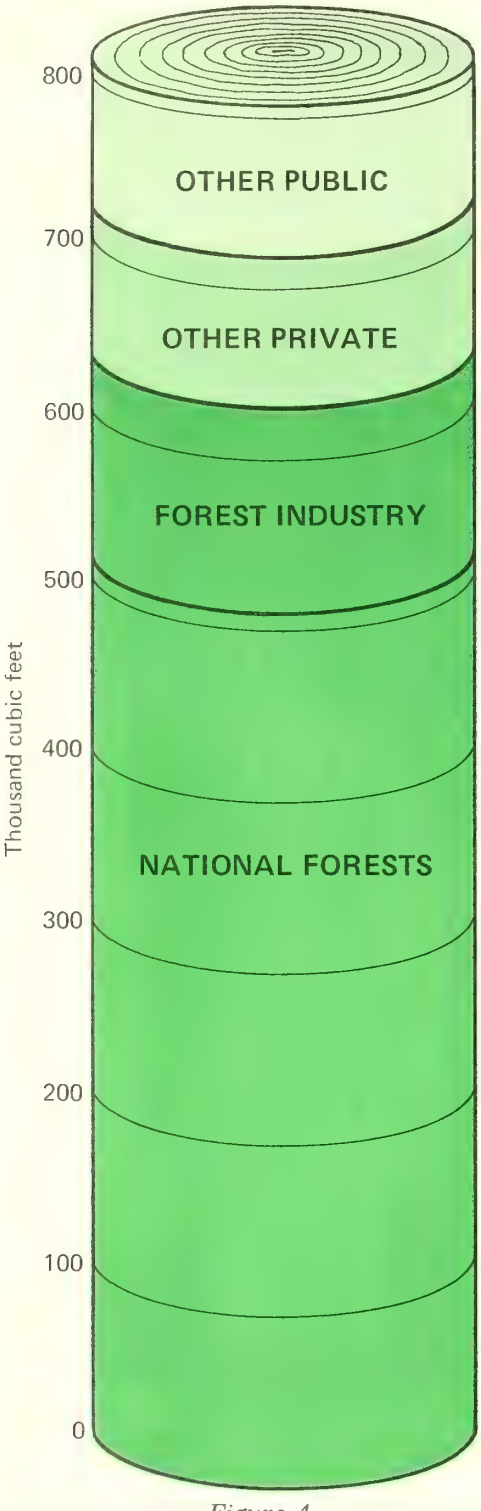


Figure 4

Forest industry lands provided 15 percent of the 1966 output — not significantly different from 1962. About 11 percent came from other private lands in 1966.

Idaho and Montana led in output of most roundwood products

Idaho and Montana had the largest volume of roundwood product output and together accounted for over two-thirds of the total Rocky Mountain States output in 1966. The relative importance of States in 1966 was about the same as it had been for quite a few years, as shown in table 2.

Not all roundwood products were produced in all Mountain States, and some of them varied in relative importance from State to State. Saw logs, however, were one exception and were by far the most important product in all States except Nevada where fuelwood and posts accounted for most of the small volume of output from timberlands within the State. The percentage distribution of saw-log output by States was quite similar to that of all roundwood. Veneer logs were produced in only three States; Idaho and Montana accounted for 93 percent of the total output, the remainder came from Colorado. The pulpwood output came largely from Idaho (37 percent) and Arizona (27 percent). The only other States with significant volumes were western South Dakota and Montana.[5] Idaho and Montana accounted for 28 percent of the output of all roundwood other than saw logs, veneer logs, and pulpwood.

Number of active sawmills declines, plywood plants increase

There were 657 active sawmills in the Rocky Mountain States in 1966, as compared to 864 in 1962 — a decrease of 24 percent.

---

[5] *Western South Dakota output and part of the Idaho and Montana output were shipped to mills in the Lake States.*

Table 2. — Output of roundwood products, by State, for selected years, 1952-1966

State	Year				
	1952	1954	1958	1962	1966
			Percent		
Idaho	43.5	43.3	41.1	38.4	39.1
Montana	25.9	23.9	26.3	31.9	29.4
Western South Dakota	1.7	[1] 1.5	[1] 3.3	1.7	2.0
Wyoming	2.8	2.9	3.2	3.2	4.1
Arizona	10.8	10.0	8.9	10.1	11.1
Colorado	7.3	6.1	6.7	5.6	6.3
Nevada	.1	.8	.9	.1	([2])
New Mexico	6.4	9.5	7.7	7.1	6.3
Utah	1.5	2.0	1.9	1.9	1.7
Total	100.0	100.0	100.0	100.0	100.0

[1] *Computed from data for entire State; separate data for western South Dakota not available for 1954 and 1958.*

[2] *Less than 0.05 percent.*

The following tabulation shows the 1966 distribution of mills by State.

State	*Number of active mills*
Idaho	168
Montana	148
Western South Dakota	21
Wyoming	65
Arizona	23
Colorado	116
Nevada	2
New Mexico	64
Utah	50
Total	657

Average lumber production per mill in 1966 was 6.4 MMBF as compared with 4.2 million in 1962. One important factor contributing to the higher average production per mill in 1966 was the substantial decrease in the number of smaller mills as shown in table 3.

In 1966, log imports to sawmills and veneer and plywood plants in the Mountain States were reported as 74 MMBF and came mainly from California and Washington. Considerable movement of logs across State boundaries occurred within the Mountain States, especially between Idaho and Montana.

In 1966 about 92,000 cords, or practically one-third of the round pulpwood harvested

Table 3. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1962	112	25.1	77.7
	1966	114	30.2	81.5
1 to 10 million	1962	232	2.9	18.9
	1966	167	3.9	15.4
Less than 1 million	1962	520	.2	3.4
	1966	376	.3	3.1

[1] *1962 and 1966 averages obtained by prorating the Bureau of the Census lumber production figures among mill classes on the basis of the Intermountain Station's surveys of saw-log receipts.*

from timberlands in the Rocky Mountain States went to the Lake States. Also marketed in the Lake States were nearly 90,000 cords of chips. The latter volume constituted 6 percent of the volume of chips and sawdust produced as a pulpwood byproduct of sawmills in the Mountain States. The leading States in exports of round pulpwood to the Lake States were western South Dakota (54,000 cords) and Montana (37,000 cords). Of the round pulpwood exported to the Lake States, ponderosa pine comprised about one-half of the volume and lodgepole pine two-fifths.

Veneer and plywood plants increased from eight in 1962 to 12 in 1966. Distribution of plants for the 2 years was as follows:

State	*1962*	*1966*
Idaho	3	5
Montana	5	6
Colorado	0	1

There were four active pulpmills in the Mountain States in 1966, one in Idaho, one in Montana, and two in Arizona. Only three mills were active in 1962.

Utilization of roundwood improved — byproducts increased, residues decreased

Volume of plant byproducts in 1966 amounted to 201 MMCF or about one-fourth the volume of roundwood. Distribution of this volume by type of byproduct was as follows:

Byproduct	*MMCF*	*Percent*
Fiber[1]	116	58
Industrial fuel	67	33
Domestic fuel	2	1
Others	16	8
Total	201	100

[1] *Mainly chips and sawdust for pulpwood.*

Nearly 90 percent of the total volume of plant byproducts came from sawmills; veneer and plywood plants were the principal source of the remainder.

Byproduct volume in 1966 was nearly three times the 1962 output of 68.7 MMCF. The latter represented only 11 percent of the roundwood volume for that year. Idaho and Montana made the greatest gains in volume between 1962 and 1966, although percentagewise Nevada and Arizona were outstanding. The biggest increases in volume occurred in States with pulpmills and papermills — Idaho, Montana, and Arizona.

Volume of plant residues is affected not only by the total volume of roundwood received at mills, but also by the proportion of roundwood volume utilized for byproducts. Therefore, it is not surprising that in light of the big increase in byproduct volume in 1966 as compared with 1962, plant residues decreased 38 MMCF or 19 percent. This overall decrease occurred despite the fact that reductions occurred in only four States:

State	*Reduction in residue volume 1962 to 1966*	
	(MCF)	*(Percent)*
Montana	24,614	39
Idaho	23,947	30
Western South Dakota	523	19
New Mexico	1,930	11

Increases occurred in all other States and amounted to 13 MMCF. The biggest increases were in Nevada (627 percent) and Wyoming (39 percent).

The 1966 volume of plant residues amounted to 20 percent of roundwood volume — a decrease from the 31 percent in 1962.

The lumber industry was by far the major producer of residues; only about 3 percent of the total volume came from other industries.

Nearly three-fifths of the residues volume was fine material (sawdust and shavings). The remainder was slabs, edgings, and similar coarse material.

Roundwood products were mainly from growing stock inventory

In 1966, 759 MMCF or 94 percent of the total volume of roundwood products came

Table 4. — Removals from growing stock, by State, 1966

State	Total removals	All products	Logging residues	Other removals
	Thousand cubic feet			
Idaho	338,508	301,930	36,034	544
Montana	270,555	233,369	36,860	326
Western South Dakota	15,775	14,923	767	85
Wyoming	35,980	32,596	2,715	669
Arizona	81,198	71,032	7,509	2,657
Colorado	56,404	49,432	4,346	2,626
Nevada	76	76	([1])	([1])
New Mexico	49,320	42,849	5,122	1,349
Utah	15,484	13,146	1,486	852
Total	863,300	759,353	94,839	9,108

[1] *Less than 0.5 MCF.*

from the growing stock inventory on commercial forest land. The remaining 6 percent came from cull and dead trees on commercial forest land and from harvesting trees on other lands.

The net volume of growing stock trees removed from inventory in 1966 was 863 MMCF of which 88 percent went into roundwood products. Logging residues (the unused portions of trees cut or killed by logging) accounted for 95 MMCF (11 percent). An operation that had a large amount of logging residue is shown in figure 5. Other removals (the net volume of growing stock trees removed from inventory by cultural operations such as timber-stand improvements, land clearing, and changes in land use) accounted for the remaining 9 MMCF or 1 percent of total removals. Removals from growing stock by type of removals and by State for 1966 are shown in table 4.

Total sawtimber removals from commercial forest land were 5 billion board feet, of which 93 percent went into roundwood products. Logging residues accounted for 6 percent and other removals, 1 percent.

Tables 25 through 34, in Appendix B, present additional statistics concerning timber products of the Rocky Mountain States.

Figure 5.—An operation in north Idaho illustrating a large amount of logging residue. Such residues accounted for 11 percent of the 863 MMCF of growing stock removals in the Rocky Mountain States in 1966. Nearly all the remaining volume of timber removals went into roundwood products, with ponderosa pine and Douglas-fir the two leading species harvested.

IDAHO

Idaho led all other Mountain States with 316 MMCF of roundwood product output in 1966 or 39 percent of the total for the Mountain States. The 1966 output for Idaho represents a 27 percent increase since 1962, and 61 percent since 1952, but about a 4 percent decrease from 1956 (figure 6).

Saw logs accounted for four-fifths of roundwood output; veneer log and pulpwood output was up sharply

The volume of saw-log output in 1966 was 260 MMCF (1,665 MMBF), which represents a 10 percent increase since 1962. The saw-log output was 82 percent of the total roundwood volume in 1966 — about 12 percent less than in 1962. Veneer-log production of 39 MMCF represented about 12 percent of the total roundwood product output and was about 14 times the amount in 1962. Pulpwood output was 9 MMCF, nearly double the 1962 volume, and accounted for 3 percent of all roundwood products in 1966. With several new chipmills using round pulpwood already operating or under construction, pulpwood production will undoubtedly continue upward. The 1966 output of all other products combined was 8 MMCF, up about 26 percent from 1962; this volume accounted for nearly 3 percent of all roundwood products.

Saw-log production continued to parallel total roundwood output with respect to percent of increases since 1952. The total output of all other products made a sharp relative increase between 1962 and 1966. Compari-

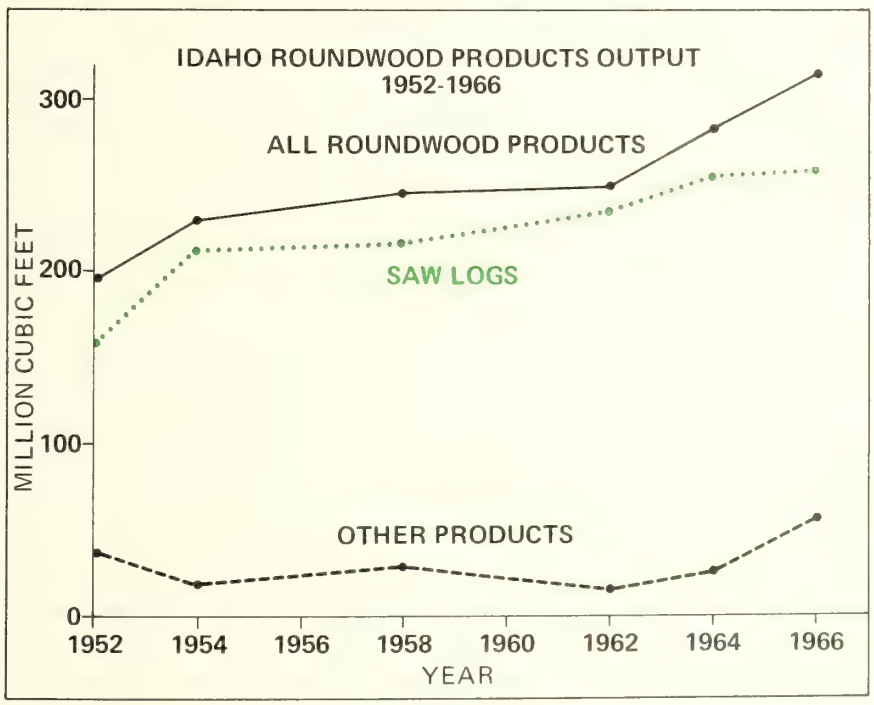


Figure 6

Table 5. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	1,547,334	1,665,425	8
Veneer logs	Thousand board feet	19,030	258,129	1,256
Pulpwood	Thousand standard cords	66	107	62
Commercial poles	Thousand pieces	150	192	28
Posts	Thousand pieces	818	699	−15
Mine timbers	Thousand cubic feet	223	142	−36
Miscellaneous industrial wood[1]	Thousand cubic feet	124	751	506
Miscellaneous farm timbers	Thousand cubic feet	2,302	1,525	−34
Fuelwood	Thousand standard cords	5	15	200
All products	Thousand cubic feet	249,231	316,188	27

[1] *Includes products such as house logs, shingle bolts, and similar items.*

sons for saw logs and various other products are shown in table 5.

Fifty-five percent of Idaho's 1966 saw-log output came from three counties. Clearwater County contributed 30 percent (494 MMBF) of the total. Shoshone and Idaho Counties provided 13 percent (222 MMBF) and 12 percent (206 MMBF) respectively. Clearwater and Shoshone Counties' output increased substantially since 1962 while Idaho County's was down slightly. Over half of Idaho's veneer-log output of 258 MMBF came from Clearwater County; Idaho County accounted for 24 percent (63 MMBF). The pulpwood volume of 106,652 standard cords came primarily from Clearwater County (42 percent) and Bonner County (34 percent).

One hundred and fifteen MMBF of saw logs were exported from Idaho in 1966, with 95 percent of the volume going to Montana. The remainder went to Washington and Wyoming.

Sixty percent of all product volume came from Douglas-fir, true firs, and western white pine

Douglas-fir, true firs, and western white pine led all species in total roundwood production as well as in both saw-log and veneer-log output. Ponderosa pine and western redcedar were other species used for a number of products (figure 7). Lodgepole pine was used mainly for saw logs, pulpwood, posts, fuelwood, and miscellaneous farm timbers. Western hemlock was a significant pulpwood species.

The output of all major species went up from 1962, especially lodgepole pine (182 percent), western white pine (67 percent), and western larch (44 percent). Douglas-fir was up 16 percent, true firs 15 percent, and ponderosa pine 5 percent.

National Forests supplied more than one-half of roundwood

National Forests were the source of 171 MMCF or 54 percent of the roundwood products in 1966. Forest industry lands provided a harvest of 72 MMCF, or 23 percent. The remainder of the output came from the other public and other private classes in about equal proportions.

Output of all four classes of ownership was higher in 1966 than in 1962. The largest increase was in the National Forest contribution, which rose 42 percent. This compares with a 13 percent increase for forest industry lands, 14 percent for other private lands, and 11 percent for other public lands.

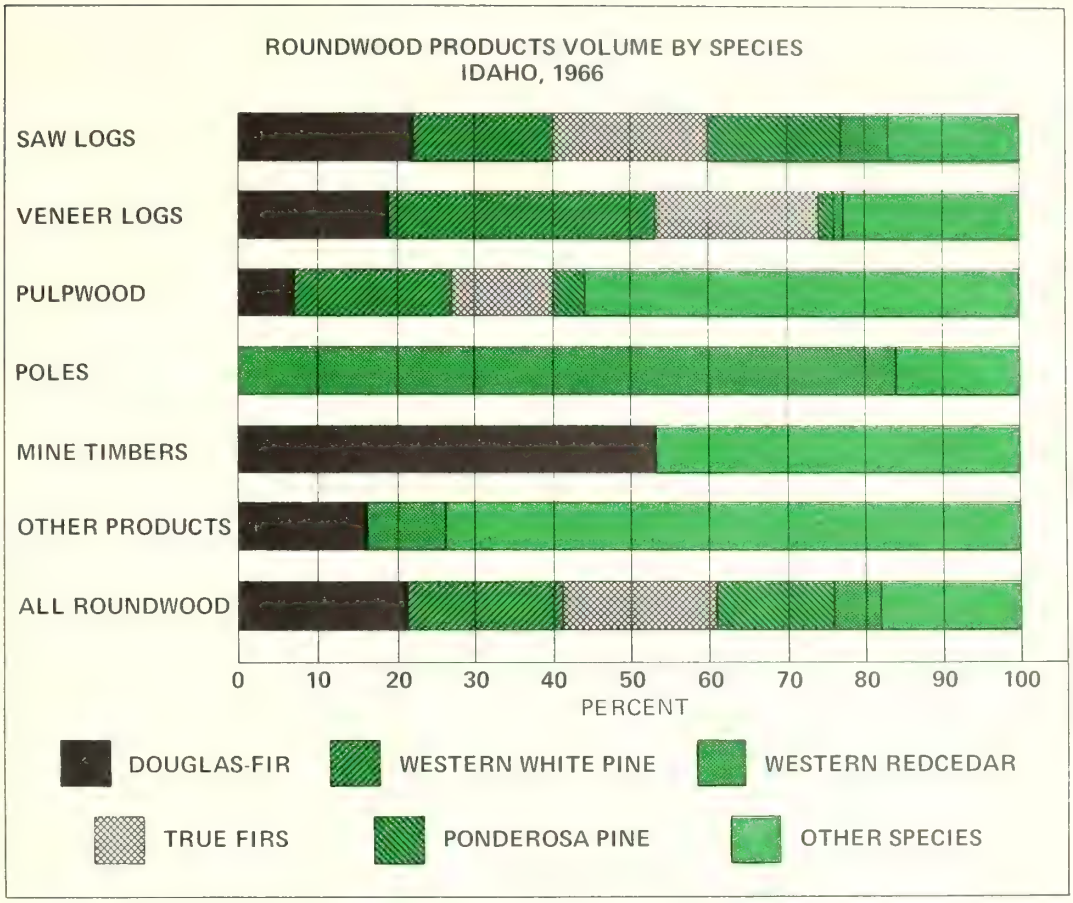


Figure 7

Fewer sawmills produce more lumber

In 1966, there were 168 active sawmills in Idaho as compared to 193 in 1962, continuing the trend towards fewer mills. Average lumber production per mill was up 20 percent to 9.5 MMBF, which is almost half again as high as the average production for all Mountain States mills (6.4 MMBF). Table 6 presents production and number of sawmills for selected years.

As shown in table 6, there was a small increase in the number of large and small mills and a decrease of 35 mills in the medium size class between 1962 and 1966.

Imports of logs to sawmills and plywood plants in Idaho in 1966 were reported as 40 MMBF from Montana, 29 million from Washington, and 123,000 from Wyoming. About 94 percent of this volume was in saw logs, the remainder, veneer logs.

Plant byproducts are of increasing significance; residue volume is less

The volume of plant byproducts totaled 92 MMCF in 1966 which represents 46 percent of the entire Mountain States output. Industrial sources of these materials and types of byproducts are shown in table 7.

Byproduct volume in 1966 was more than double the 38.9 MMCF output of 1962. Idaho thus made the greatest gain in volume of any of the Mountain States between 1962 and 1966. Other States showed greater percentage increases.

As would be expected, the significant increase in byproduct volume was accompanied by a very substantial decrease in plant residues, 24 MMCF, between 1962 and 1966. The 1966 volume of plant residues amounted

Table 6. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1956	37	31.5	73
	1962	42	28.2	78
	1966	45	31.3	88
1 to 10 million	1956	108	3.8	25
	1962	81	3.8	20
	1966	46	3.8	11
Less than 1 million	1956	166	.2	2
	1962	70	.4	2
	1966	77	.2	1

[1] *1956 averages derived from a cooperative lumber survey by the Bureau of the Census and the Intermountain Station; 1962 and 1966 averages obtained by prorating the Bureau of the Census lumber production figures among mill classes on the basis of the Intermountain Station's surveys of saw-log receipts.*

to 18 percent of roundwood, considerably less than the 32 percent of 1962.

Nearly all the plant residues were produced by the lumber industry. About three-fifths of the volume was fine material (sawdust and shavings) and two-fifths coarse material such as slabs and edgings. Between 1962 and 1966, coarse residues showed a reduction of nearly one-half in volume and fine residues of somewhat less than one-fourth.

Growing stock provided nearly all roundwood products

In Idaho, 95 percent (302 MMCF) of the total volume of roundwood products harvested came from the growing stock inventory on commercial forest land. Cull and dead trees on commercial forest land and harvesting of trees on other lands provided the remaining volume of roundwood products.

Eighty-nine percent of the total removals from growing stock went into roundwood products. Logging residues (36 MMCF) accounted for nearly all of the remaining volume. Timber-stand improvement operations, land clearing, and changes in land use contributed a very small volume.

Total sawtimber removals from commercial forest land were 1,974 MMBF with 94 percent (1,859 MMBF) going into products. Logging residues accounted for 112 MMBF, nearly all of the remaining volume.

Tables 35 through 39, in Appendix B, present additional statistics concerning timber products of Idaho.

Table 7. — Volume of plant byproducts by industrial source and use class, 1966

Industrial source	All byproducts	Fiber[1]	Industrial fuel	Domestic fuel	Other byproducts[2]
	Million cubic feet				
Lumber industry	79.0	42.3	28.4	0.5	7.8
Veneer and plywood industry	13.2	11.0	.1	([3])	2.1

[1] *Mainly chips and sawdust for pulpwood.*
[2] *Includes livestock bedding, mulch, and small dimension and specialty items.*
[3] *Less than 0.05 MMCF.*

MONTANA

Output of roundwood products from Montana timberlands in 1966 amounted to 238 MMCF or 30 percent of the total from lands within the Mountain States. Production showed an increase of 15 percent over 1962 and was slightly more than double the volume for 1952. In comparison, production for the Mountain States increased 25 percent over the 1962-66 period and 79 percent between 1952 and 1966.

Saw logs accounted for more than four-fifths of roundwood output

The 1966 saw-log volume of 196 MMCF (1,254 MMBF) constituted 82 percent of the total volume of roundwood products. Veneer logs were second in volume (28 MMCF) and contributed nearly 12 percent of the roundwood output. The remaining 6 percent consisted of volume in pulpwood, poles, posts, mine timbers, fuelwood, and other roundwood for a variety of uses.

Saw-log production continued roughly to parallel total roundwood output with respect to percent of increases since 1952 (figure 8). However, the total output of all other products made a sharp relative increase between 1962 and 1966. Comparisons for these other roundwood products, as well as for saw logs, are shown in table 8.

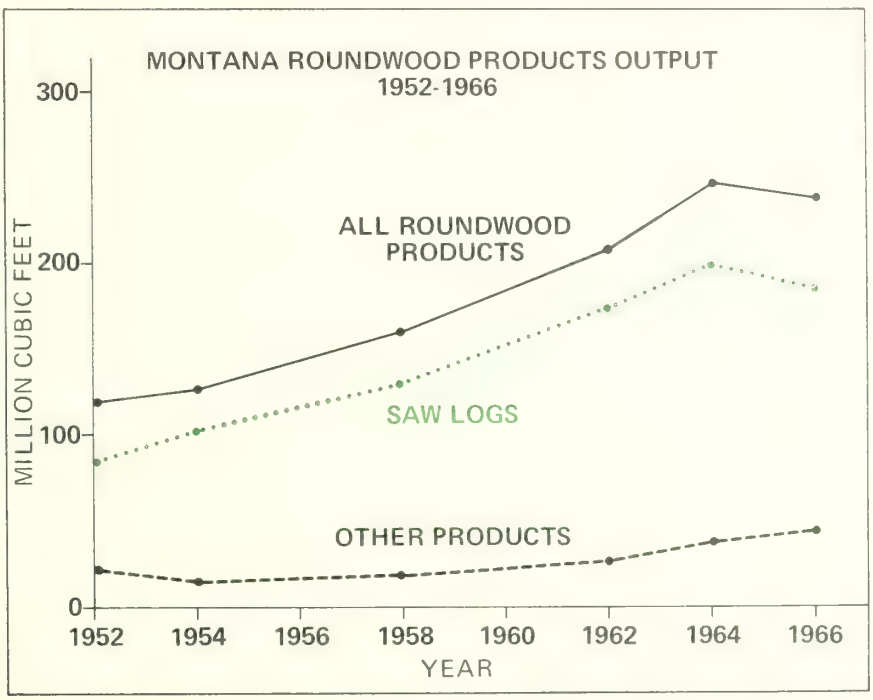


Figure 8

Table 8. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	1,275,688	1,253,868	—2
Veneer logs	Thousand board feet	110,654	183,449	66
Pulpwood	Thousand standard cords	47	44	—6
Commercial poles[1]	Thousand pieces	122	133	9
Posts	Thousand pieces	1,047	1,569	50
Mine timbers	Thousand cubic feet	271	2,974	997
Miscellaneous industrial wood[2]	Thousand cubic feet	281	256	—9
Miscellaneous farm timbers	Thousand cubic feet	2,108	3,027	44
Fuelwood	Thousand standard cords	4	8	100
All products	Thousand cubic feet	207,289	238,231	15

[1] *Includes a small amount of piling.*
[2] *Includes products such as house logs, converter poles, and similar items.*

Relatively few counties provided the major portion of the timber products output. Of the 1,254 MMBF of saw logs removed from Montana timberlands, nearly 25 percent came from Lincoln County; Flathead with 13 percent and Sanders and Missoula with 12 percent each were the other leading counties. Veneer-log output from timberlands within the State (183 MMBF) came largely from three counties — Flathead 34 percent, Missoula 30 percent, and Lincoln 19 percent. The pulpwood volume of 43,645 cords came from two counties: Gallatin County produced 85 percent and Lincoln County 15 percent (figure 9).

Although products harvested from Montana timberlands were largely used by industries within the State, there were some significant exports. The round pulpwood was exported — 85 percent to the Lake States, the remainder to Washington State. Other exports consisted of about 42 MMBF of saw logs and veneer logs to Idaho and Wyoming, and a small number of commercial poles to the Lake States.

Douglas-fir led in product volume

Douglas-fir, with 81 MMCF harvested for roundwood products, was by far the leading species in 1966. The other important species contributing to total roundwood output were western larch (46 million), ponderosa pine (36 million), and lodgepole pine (32 million). However, as shown by figure 10, species varied substantially in importance by individual products.

The output of most major species went up from 1962 along with the general increase in roundwood volume. The biggest increase (62 percent) was for lodgepole pine. Douglas-fir output was up 17 percent and ponderosa pine was up 23 percent. Western larch declined about 7 percent in product volume.

National Forests supplied nearly three-fifths of roundwood

Montana's National Forests were the source of 141 MMCF, or 59 percent of the roundwood products in 1966. Forest industry lands provided a harvest of 39 MMCF or 17 percent. Other private owners furnished 15 percent of the product volume, and lands classed as other public, 9 percent.

Output from National Forest lands in 1966 increased 22 percent over 1962, and output from other public holdings increased by 109 percent. The 1966 volume from other private lands remained about the same as 1962, while output from forest industry lands declined 11 percent.

Figure 9. — Loading pulpwood near Bozeman, Montana, for shipment to mills in the Lake States.

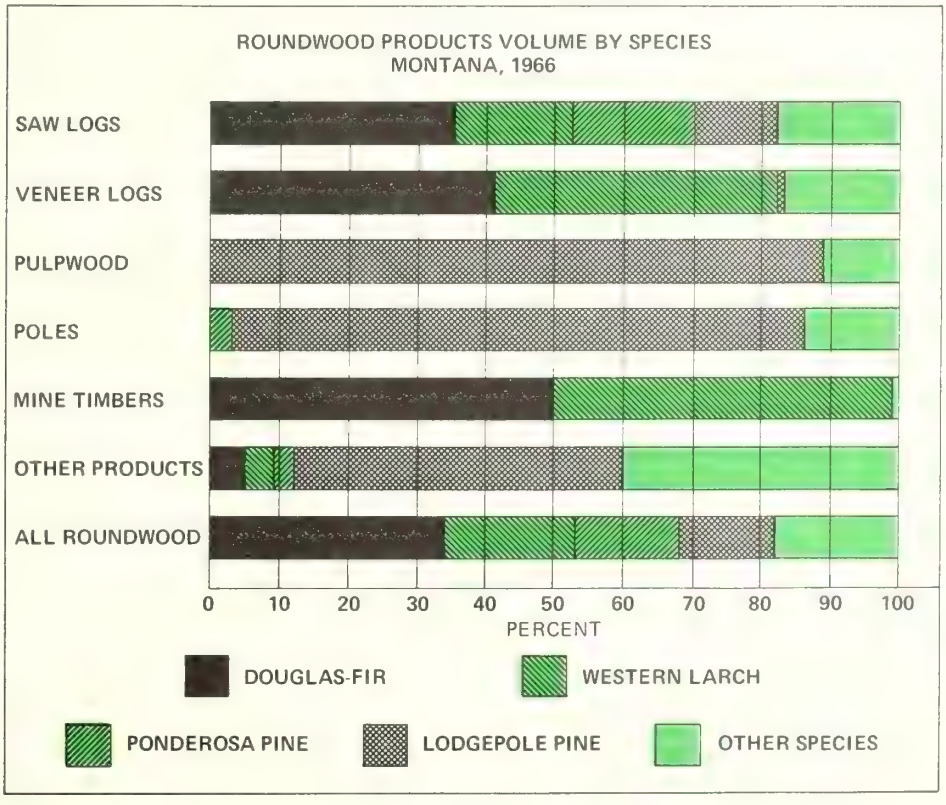


Figure 10

Table 9. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1956	26	25.1	67
	1962	40	23.4	87
	1966	37	33.5	90
1 to 10 million	1956	78	3.4	27
	1962	40	2.7	11
	1966	25	3.3	6
Less than 1 million	1956	229	.3	6
	1962	129	.2	2
	1966	86	.6	4

[1] *1956 averages derived from a cooperative lumber survey by the Bureau of the Census and the Intermountain Station; 1962 and 1966 averages obtained by prorating the Bureau of the Census' lumber production figures among mill classes on the basis of the Intermountain Station's surveys of saw-log receipts.*

Sawmills were fewer but average production increased

The trend over recent years toward fewer mills but greater average production per mill continued in 1966. Average production of the 148 mills active in 1966 was 9.3 MMBF. In comparison, average production of the 209 mills in 1962 was 5 MMBF, and of the 333 mills in 1956, 3 million. Table 9 presents this information for sawmills in selected size-class groupings.

As indicated in table 9, between 1962 and 1966 the number of mills declined in all size classes. Most of the decrease in number, especially in the small size class, resulted from mills becoming inactive or going out of business.

Log receipts at Montana mills include logs imported from other States as well as those received from Montana timberlands. Imports of logs to sawmills and plywood plants in Montana in 1966 are reported as 109 MMBF from Idaho, and 67,000 from Wyoming; about 97 percent of this volume was in saw logs, the remainder veneer logs.

Table 10. — Volume of plant byproducts by industrial source and use class, 1966

Industrial source	All byproducts	Fiber[1]	Industrial fuel	Domestic fuel	Other byproducts[2]
	Million cubic feet				
Lumber industry	64.7	34.0	26.4	0.7	3.6
Veneer and plywood industry	8.8	8.2	.2	.3	.1
Total	73.5	42.2	26.6	1.0	3.7

[1] *Mainly chips and sawdust for pulpwood.*
[2] *Includes livestock bedding, mulch, and small dimension and specialty items.*

Plant byproducts were up sharply since 1962; residues down

The 1966 volume of plant byproducts amounted to 73.5 MMCF. The industrial sources of these materials and types of byproducts are shown in table 10.

The 1966 volume of plant byproducts represents three times the volume produced in 1962. This increased utilization partially explains the reduction in unused plant residues from 63 MMCF in 1962 to 38 million in 1966. The greatest decrease in residue volume was in the lumber industry — from 57 MMCF in 1962 to 37 million in 1966, or 35 percent less. However, the plywood industry showed the greatest percentage decrease — 87 percent. Other industries did not change significantly in residue volume.

Of the 1966 residue volume of 38 MMCF, about two-thirds was fine material (sawdust and shavings), and the remainder was coarse material (slabs, edgings, veneer cores, and trimmings). Between 1962 and 1966 coarse residues showed a reduction of about one-half in volume, and fine residues somewhat less than one-third.

Nearly all roundwood products came from growing stock inventory

Of the total volume of roundwood products harvested in Montana in 1966, 98 percent, or 233 MMCF, came from the growing stock inventory on commercial forest land. Cull and dead trees on commercial forest land and harvesting of trees on other lands provided the remaining 2 percent.

Eighty-six percent of the total removals from growing stock went into roundwood products; nearly all of the remainder was in the form of logging residues (37 MMCF), although a very small volume resulted from timber-stand improvement operations, land clearing, and changes in land use.

Total sawtimber removals from commercial forest land were 1,571 MMBF with more than 92 percent (1,452 MMBF) going into products. Logging residues accounted for 117 MMBF, nearly all of the remaining volume.

Tables 40 through 44, in Appendix B, present additional statistics concerning timber products of Montana.

WESTERN SOUTH DAKOTA

Output of roundwood products from western South Dakota timberlands in 1966 amounted to nearly 16 MMCF or about 2 percent of the total from lands within the Mountain States. Production increased 41 percent over 1962 and more than doubled the 1952 output (figure 11). In comparison, production for the Mountain States increased 25 percent over the 1962-66 period and 79 percent between 1952 and 1966.

Saw logs were still predominant but pulpwood output was moving up

The 1966 saw-log volume of 6.9 MMCF (44 MMBF) constituted 44 percent of the total volume of roundwood products. Pulpwood was second in volume (4.7 MMCF) and contributed 29 percent of the roundwood output. The remaining 27 percent consisted of posts, fuelwood, poles, mine timbers, and miscellaneous farm timbers.

As indicated by figure 11, saw-log output as a percentage of total product volume has followed a generally declining trend since 1952. Between 1954 and 1958 the combined volume of other products began increasing more rapidly than saw-log volume. Pulpwood became a significant product between 1958 and 1962 and subsequently made further gains. Total output of all products in 1966 was up 5 MMCF, or 41 percent over 1962; comparisons for major products are shown in table 11.

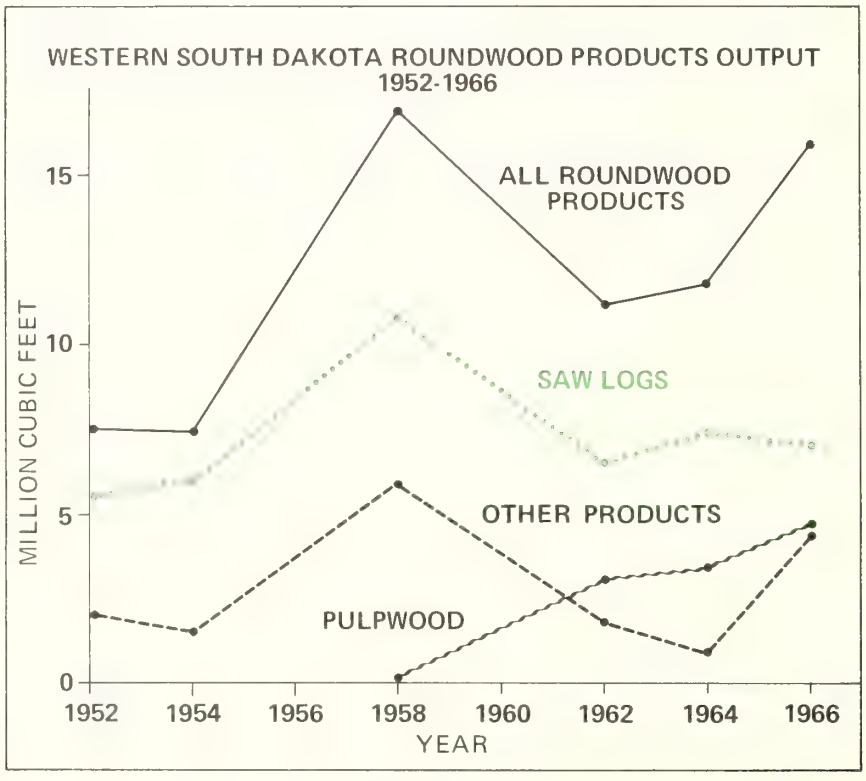


Figure 11

Table 11. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	38,958	44,308	14
Pulpwood	Thousand standard cords	34	54	59
Mine timbers	Thousand cubic feet	0	1	100
Posts, fuelwood, miscellaneous farm timbers[1]	Thousand cubic feet	1,682	4,301	156
All products	Thousand cubic feet	11,235	15,859	41

[1] *Includes volume of commercial poles.*

Distribution of the saw-log output among the four counties or portions of counties from which harvested was as follows:

County	*Percent*
Custer	33.9
Lawrence	20.8
Meade	11.9
Pennington	33.4
	100.0

About 97 percent of the product volume was ponderosa pine. The remainder was white spruce and practically all of this went into pulpwood.

Not all products harvested from western South Dakota timberlands were processed by industries within the State. About 10 MMBF, or 23 percent of the saw-log output, went to mills in Wyoming. And the entire pulpwood output, both roundwood and chips, went to mills in the Lake States.

Public lands provided nine-tenths of roundwood volume

In 1966 as in 1962 public lands — particularly National Forests — provided the preponderance of the 15.9 MMCF of product volume:

Land ownership class	*1962*	*1966*
	(Percent)	
National Forest	83.9	83.4
Other public	.5	6.6
Forest industry	3.2	6.6
Other private	12.4	3.4
	100.0	100.0

Most of the 1966 harvest for the "other public" class came from State lands although Bureau of Land Management lands provided some volume.

The National Forest percentage of total product volume changed very little between 1962 and 1966, but there has been a substantial increase over the last 30 years. Data for 1935 (Ware 1936) indicate National Forest lands provided a little less than 60 percent of the harvest volume in western South Dakota.

Sawmill numbers decreased since 1962 but average production increased

Twenty-one sawmills were active in western South Dakota in 1966 and had an average cut of 2.7 MMBF per mill. In comparison, 28 mills were active in 1962 and had an average cut per mill of 1.7 MMBF. As a further comparison, average production of all mills in the Mountain States in 1966 was 6.4 MMBF.

Table 12. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1962	([2])	([2])	([2])
	1966	2	18.8	67
1 to 10 million	1962	7	6.0	87
	1966	5	2.7	24
Less than 1 million	1962	21	.3	13
	1966	14	.4	9

[1] *Averages derived by prorating the Bureau of Census' lumber production figures among mill classes on the basis of the Intermountain Station's survey of saw-log receipts.*

[2] *To avoid the possibility of disclosing individual operations in 1962, data for the few mills in this class were included in the 1 to 10 million class.*

Table 12 provides a comparison between 1962 and 1966 of South Dakota mills by size-class groups.

It is apparent from the above that the total reduction of 7 mills by 1966 occurred in the small size class. This reduction, together with substantially increased production of mills in the large and medium classes accounted for the increased average output per mill.

Sawmill log receipts include logs imported from outside the State as well as those received from western South Dakota timberlands. In 1966, imports of saw logs were reported as 10 MMBF from Wyoming. These imports just about balance the volume of saw-log exports mentioned earlier.

Volume of plant byproducts increased sharply since 1962; residues decreased slightly

The 1966 volume of plant byproducts amounted to 1.5 MMCF — practically all of it from the lumber industry. Distribution of this volume by type of byproduct was as follows:

Byproduct	*MCF*
Pulp chips	811
Industrial fuel	558
Domestic fuel	48
Other[1]	116
Total	1,533

[1] *Includes such byproducts as livestock bedding, mulch, and small dimension and specialty items.*

The 1966 volume of plant byproducts represents more than two and one-half times the volume produced in 1962.

The volume of unused plant residues in 1966 amounted to 2.2 MMCF — down slightly from the 2.7 million in 1962. Two-thirds of the 1966 residues were fine material (sawdust and shavings); the remainder were slabs, edgings, trimmings, and similar coarse material.

Nearly all roundwood volume came from growing stock inventory

Of the total volume of roundwood products harvested in western South Dakota in 1966, 94 percent, or 14.9 MMCF, came from the growing stock inventory on commercial forest land. Cull and dead trees on commercial forest land and timber harvested on other lands provided the remaining 6 percent. Ninety-five percent of the total removals from growing stock went into roundwood products; the bulk of the remainder was in the form of logging residues, although there was some volume resulting from timber-stand improvement operations, land clearing, and changes in land use.

Total sawtimber removals from commercial forest land were 95 MMBF with 97 percent going into products. Logging residues accounted for nearly all of the remaining volume.

Tables 45 through 47, in Appendix B, present additional statistics concerning timber products of western South Dakota.

WYOMING

Output of roundwood products from Wyoming timberlands in 1966 amounted to 33.5 MMCF or 4 percent of the total output from lands within the Mountain States. Production showed an increase of 61 percent over 1962 and was more than two and one-half times the volume in 1952 (figure 12). In comparison, production for the Mountain States increased 25 percent over the 1962-66 period and 79 percent between 1952 and 1966.

Saw logs were about four-fifths of roundwood output

The 1966 saw-log volume of 27.1 MMCF (173.5 MMBF) constituted 81 percent of the total volume of roundwood products. Commercial poles were second in volume (3.6 MMCF) and constituted 11 percent of the roundwood output. The remaining 8 percent consisted of farm and mine timbers, posts, pulpwood, fuelwood, and miscellaneous industrial wood.

Sawmilling continues as the dominant timber industry. Since 1952, saw logs consistently have accounted for more than four-fifths of the annual output and in 1962 reached a high of 94 percent. However, as shown in table 13, several of the other products made sharp increases within the last 4 years.

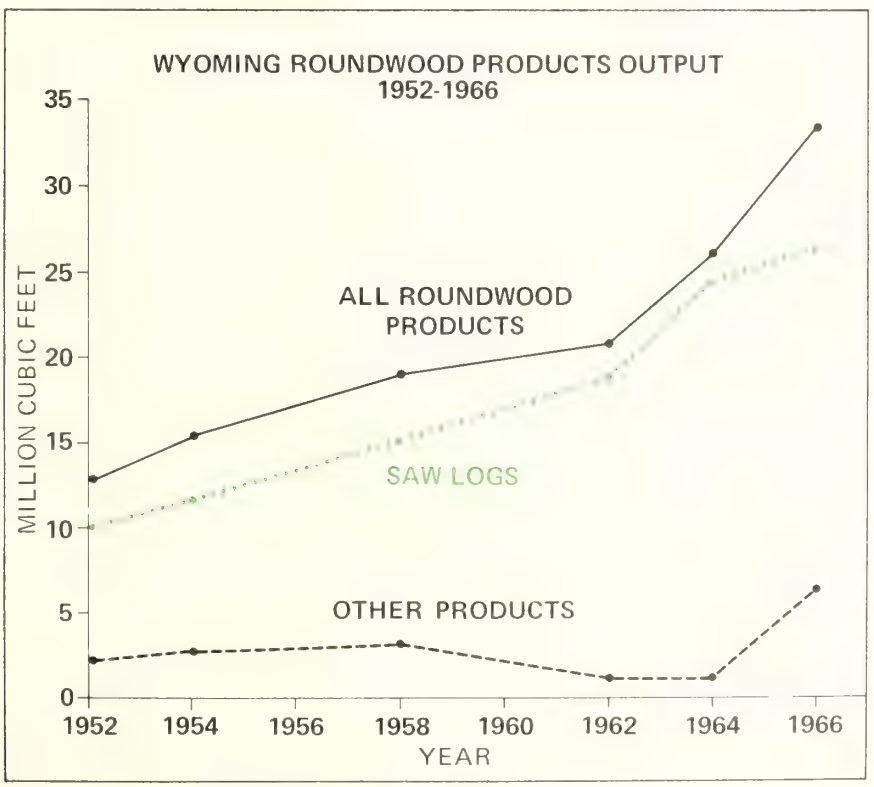


Figure 12

Table 13. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	116,523	173,491	49
Pulpwood	Thousand standard cords	4	2	—50
Posts	Thousand pieces	79	292	270
Mine timbers	Thousand cubic feet	54	478	785
Miscellaneous industrial wood[1]	Thousand cubic feet	448	5,412	1,108
Fuelwood	Thousand standard cords	1	2	100
All products	Thousand cubic feet	20,771	33,523	61

[1] *Includes products such as house logs, commercial poles, piling, miscellaneous farm timbers, and similar items.*

The leading counties and the percentage they contributed to sawmill log receipts from Wyoming timberlands were as follows:

County	*Percent*
Carbon	17.2
Fremont	15.7
Lincoln	13.7
Crook	13.5
Teton	12.9
All other counties	27.0
	100.0

Approximately 85 percent of the roundwood products harvested from Wyoming timberlands were processed by industries within the State. About 18 MMBF of saw logs were exported — mainly to western South Dakota and Colorado, although some exports went to Idaho and Montana. The small volume of round pulpwood went to mills in the Lake States, as did the entire volume of pulp chips (2.9 MMCF).

Output was predominantly lodgepole pine and came from National Forest lands

Lodgepole pine with a harvest volume of 20 MMCF, or 59 percent of the State total, continued its traditional leadership among species. The other principal species contributing to total roundwood output were ponderosa pine (21 percent), spruce (15 percent), and Douglas-fir (3 percent). However, as shown in figure 13, species varied considerably in importance for individual products.

Consumption of all major species went up from 1962 along with the general increase in roundwood volume. The largest increase (87 percent) was for ponderosa pine. Spruce was up 63 percent and lodgepole pine 58 percent.

National Forests provided 93 percent of the roundwood harvest. This is slightly higher than the 1962 percentage; the percent from other ownership classes dropped correspondingly.

Sawmill numbers declined but average production increased

The trend over recent years toward fewer mills but greater average production per mill continued in 1966. Average production of the 65 mills active in 1966 was 1.9 MMBF. In comparison, average production of the 76 mills in 1962 was 1.4 million feet, and of the 107 mills in 1957, 1.0 million. As a further comparison, average production of all mills in the Mountain States in 1966 was 6.4 MMBF. Table 14 permits comparisons for 1957, 1962, and 1966 of Wyoming mills by selected size-class groupings.

Log receipts at Wyoming mills include logs imported from other States as well as those received from Wyoming timberlands. In 1966,

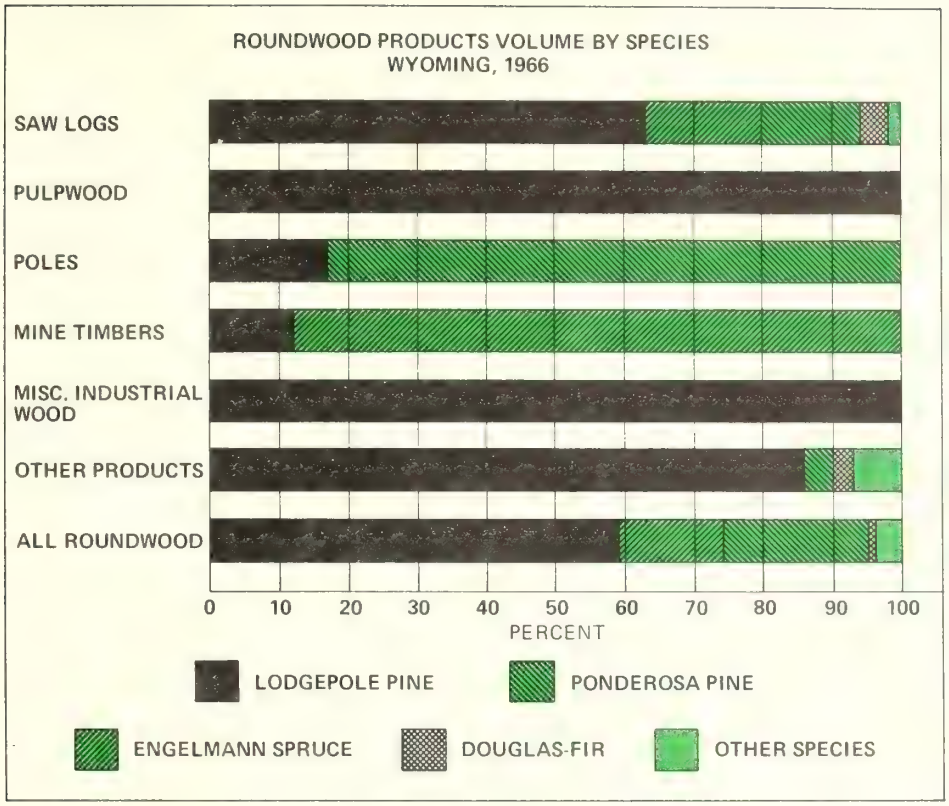


Figure 13

Table 14. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1957 }	([2])	([2])	([2])
	1962 }			
	1966	4	14.7	47
1 to 10 million	1957	22	4.0	80
	1962	19	4.7	88
	1966	19	3.2	48
Less than 1 million	1957	85	.3	20
	1962	57	.2	12
	1966	42	.1	5

[1] *1957 averages derived from a cooperative lumber survey by the Bureau of the Census and the Intermountain Station; 1962 and 1966 averages obtained by prorating the Bureau of the Census' lumber production figures among mill classes on the basis of the Intermountain Station's surveys of saw-log receipts.*

[2] *To avoid the possibility of disclosing individual operations in 1957 and 1962, data for the few mills in this class were included in the 1 to 10 million class.*

imports of logs to sawmills in the State amounted to 16.2 MMBF. Of this volume, 10.2 million came from western South Dakota, the remainder from Idaho, Utah, and Montana. The volume of saw-log imports was somewhat less than the 18 MMBF indicated earlier as exported.

Both plant byproduct and residue volumes increased since 1962

The 1966 volume of plant byproducts amounted to 3.3 MMCF — practically all of it from the lumber industry. Distribution of this volume by type of byproduct was as follows:

Byproducts	*MCF*
Pulp chips	2,928
Industrial fuel	165
Domestic fuel	137
Other[1]	83
Total	3,313

[1] *Includes such byproducts as livestock bedding, mulch, and small dimension and specialty items.*

The 1966 volume of plant byproducts represents a little more than three times the volume produced in 1962. Despite this increased production of byproducts, the volume of residues increased from 8.6 MMCF in 1962 to 11.9 million in 1966 — about a 39 percent increase. This contrasts with a 19 percent reduction for the Mountain States area. Ninety percent of the residues came from the lumber industry and about one-half the volume was fine material (sawdust and shavings), and one-half slabs, edgings, trimmings, and similar coarse material.

Product volume was largely from growing stock inventory

Of the total volume of roundwood products harvested in Wyoming in 1966, 97 percent, or 32.6 MMCF, came from the growing stock inventory on commercial forest land. Cull and dead trees on commercial forest land and timber harvested from other lands accounted for the remaining 3 percent.

Ninety-one percent of the total removals from growing stock went into roundwood products. Nearly all of the remainder was in the form of logging residues (2.7 MMCF), although a small volume resulted from timberstand improvement operations, land clearing, and changes in land use.

Total sawtimber removals from commercial forest land were 207 MMBF with 95 percent (196 MMBF) going into products. Logging residues accounted for 7 MMBF and other removals 4 million.

Tables 48 through 50, in Appendix B, present additional statistics concerning timber products of Wyoming.

ARIZONA

Timber products volume in 1966 amounted to nearly 90 MMCF, or 11 percent of the Mountain States total output — sufficient to make Arizona the third ranking State. Production was 37 percent above that of 1962 and was nearly twice (or 1.8 times) that of 1952 (figure 14). For both comparisons (1966 with 1962 and with 1952), Arizona's increase in output was well above the average increase for the Mountain States.

Saw logs were still the predominant product, but relative importance is declining

Saw-log output in 1966 (62 MMCF or 400 MMBF) was 69 percent of the volume of all roundwood products. This proportion is practically the same as it was in 1952 (68 percent). Saw-log output in Arizona, as a percentage of all roundwood products volume, apparently reached a peak in or about 1958 (86 percent) and has since been declining, although volumewise there has been an increase averaging 6.3 percent annually since 1952. However, since saw logs are still the predominant product, the output trends for saw logs and all products are, in general, similar.

Comparisons for all classes of roundwood products between 1962 and 1966 show some rather large percentage changes for products

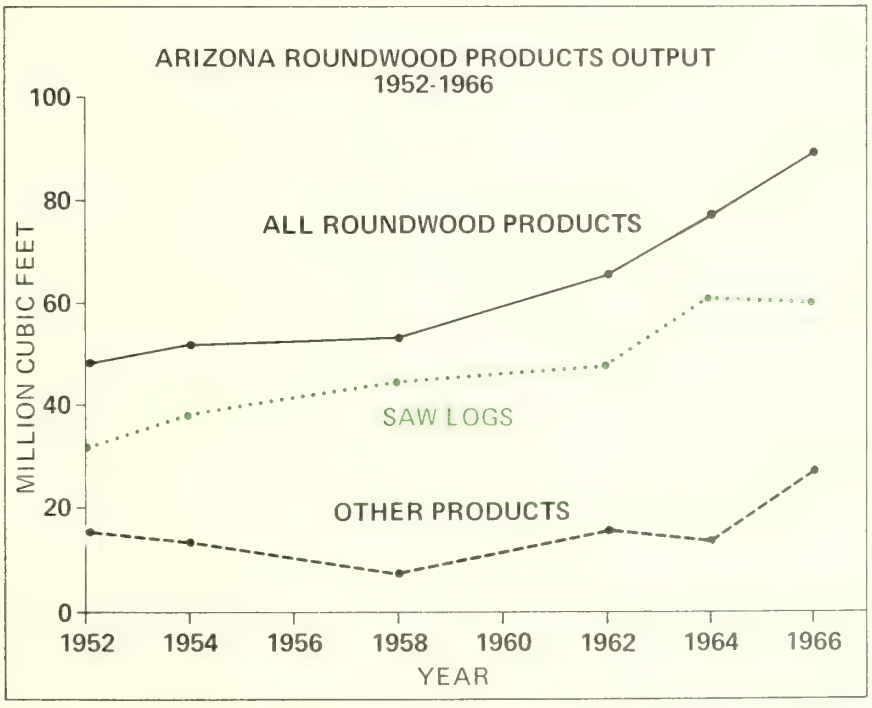


Figure 14

Table 15. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	341,757	400,236	17
Pulpwood	Thousand standard cords	88	77	−12
Commercial poles	Thousand pieces	9	18	100
Posts	Thousand pieces	173	398	130
Mine timbers	Thousand cubic feet	556	22	−96
Miscellaneous industrial wood[1]	Thousand cubic feet	389	86	−78
Miscellaneous farm timbers	Thousand cubic feet	97	556	473
Fuelwood	Thousand standard cords	97	226	133
All products	Thousand cubic feet	65,529	89,873	37
All products (except fuelwood)	Thousand cubic feet	57,187	70,437	23
All products (except saw logs and fuelwood)	Thousand cubic feet	7,632	8,000	5

[1] *Includes products such as house logs, converter poles, excelsior bolts, and similar items.*

other than saw logs and round pulpwood, as shown in table 15.

However, while the net change for all roundwood products was a gain of 37 percent, the change for industrial wood (all products except fuelwood) was 23 percent. This difference reflects the influence of the large increase in fuelwood cutting from 1962 to 1966.

Arizona had no reported log imports from other States in 1966, but about 4.6 MMBF of logs cut in Arizona were exported to New Mexico sawmills.

Nine of Arizona's 14 counties produced saw logs in 1966, but of these, three counties were predominant. Coconino County was the source of 41 percent of all saw logs and Apache County provided 35 percent. These two counties, along with Navajo County, accounted for 89 percent of all saw logs produced in the State.

Nearly 70 percent of output came from ponderosa pine

Although ponderosa pine is still by far the dominant species, its relative importance has changed during the period from 1962 to 1966. In 1962, this species constituted 81 percent (53,278 MCF) of Arizona's output, but in 1966 it furnished 69 percent (62,372 MCF) of all roundwood products. A noteworthy change occurred in the utilization of such species as pinyon pine, juniper, and aspen (figure 15); these species comprised 18 percent of the output in 1966 as compared to 8 percent in 1962. All other species (Douglas-fir, Engelmann spruce, and the true firs) provided essentially the same percentages in 1966 as in 1962.

Three-fourths of output came from National Forests

By providing 75 percent (67 MMCF) of Arizona's roundwood products, the National

Figure 15 — Aspen harvesting operation on the Coconino National Forest, Arizona. Eight-foot bolts are being cut here for production of excelsior. This operation illustrates use of a less significant timber species, as well as harvesting for one of the relatively minor products. In 1966 the principal aspen harvests were in Colorado (saw logs, excelsior, and match stock), New Mexico (saw logs), Utah (saw logs and excelsior), Arizona (saw logs and excelsior). The output of minor products (all roundwood except saw logs, veneer logs, and pulpwood) accounted for about 8 percent of the 1966 output of roundwood in the Rocky Mountain States.

Forests were easily the leading land ownership source in 1966. The second most important source was other public lands, a classification which includes not only lands under Federal management but also State, county, and municipal lands. These lands provided 24 percent (21 MMCF) of the 1966 output. Both the National Forests and the other public lands[6] increased their percentage of the total output in 1966 over their contributions in 1962, which were 69 percent and 22 percent respectively. Forest industry lands and other private lands had reduced outputs in 1966 as compared with their outputs for 1962.

Fewer sawmills produced more lumber per mill

Arizona provided no exception to the general trend of declining sawmill numbers and increased average production per active mill. The 23 sawmills active in 1966 had an average lumber production of 19 MMBF, a considerable increase over the 12 MMBF per mill for the 28 mills active in 1962, and over the 9 MMBF per mill of the 38 mills operating in 1960. Considering the short period of time,

[6] *Principally Apache Indian Reservation lands.*

Table 16. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1960 } 1962 }	([2])	([2])	([2])
	1966	10	39.3	89
1 to 10 million	1960	27	12.1	99
	1962	20	16.2	99
	1966	8	5.8	11
Less than 1 million	1960	11	.3	1
	1962	8	.2	1
	1966	5	.3	([3])

[1] *1960 averages derived from a cooperative lumber survey by the Bureau of the Census and the Intermountain Station; 1962 and 1966 averages obtained by prorating the Bureau of the Census' lumber production figures among mill classes on the basis of the Intermountain Station's surveys of saw-log receipts.*

[2] *To avoid the possibility of disclosing individual operations in 1960 and 1962, data for the few mills in this class were included in the 1 to 10 million class.*

[3] *Less than 0.05 percent.*

these have been exceptionally rapid changes. Arizona's 1966 output per mill was the highest of any of the Mountain States and was about three times the Mountain States average of 6.4 MMBF.

A more detailed picture of the changes in sawmill numbers, size classes, and average lumber production over the 6-year period is given in table 16. Arizona had two pulpmills operating in 1966, one producing both kraft pulp and groundwood, the other producing only groundwood.

Plant byproducts volume and plant residues increased since 1962

The output of plant byproducts in 1966 (19 MMCF) was nearly 18 times that of 1962 (1.1 MMCF). Although industry growth has resulted in some increase in plant residues (13.2 MMCF in 1966 as compared to 10.4 MMCF in 1962), the fact that the rise was small compared to the increase in plant byproducts is evidence of substantial gains in roundwood utilization in manufacturing plants, and in the utilization of material that formerly would have become plant residues.

Nearly four-fifths of roundwood products came from growing stock

Of the 90 MMCF of roundwood products output in 1966, 71 MMCF (79 percent) were from growing stock on commercial forest land. Cull and dead trees on commercial forest land, and harvesting of trees on other lands provided the remaining 21 percent.

Roundwood products comprised 88 percent of all removals from growing stock. Additional removals from growing stock were in the form of logging residues (9 percent, or 7.5 MMCF) and other removals through timberstand improvement operations, land clearing, or changes in land use, which amounted to an estimated 2.7 MMCF, or 3 percent of all removals from growing stock.

Total sawtimber removals from commercial forest land were 484 MMBF with more than 91 percent (443 MMBF) going into products. Logging residues accounted for 24 MMBF, and other removals for 17 million.

Tables 51 through 53, in Appendix B, present additional statistics concerning timber products of Arizona.

COLORADO

Colorado's output of nearly 51 MMCF of roundwood products in 1966 ranked it fifth in the Mountain States and the volume amounted to 6 percent of the Mountain States total output. Production was 40 percent above that of 1962 and was more than one and one-half times that of 1952 (figure 16). Colorado's percentage increase in output since 1962 was the third largest in the Mountain States.

Saw logs accounted for more than three-fourths of roundwood output

The volume of saw-log output in 1966 was 39 MMCF (252 MMBF) and represented 77 percent of the total volume of roundwood products. Saw-log output increased 25 percent as compared to 1962. Veneer logs[7] were second in volume with 5 MMCF (33 MMBF) and contributed 10 percent of the roundwood output. Round mine timbers accounted for 2.6 MMCF and contributed 5 percent of the output, the remaining 8 percent consisting of volume in poles, posts, fuelwood, pulpwood, and other roundwood for a variety of uses.

Saw-log production continued to parallel total roundwood output with respect to percent of increase since 1952. The total output of other products made a sharp relative increase between 1962 and 1966. Comparisons

[7] *Veneer logs used in Colorado are of average saw-log quality.*

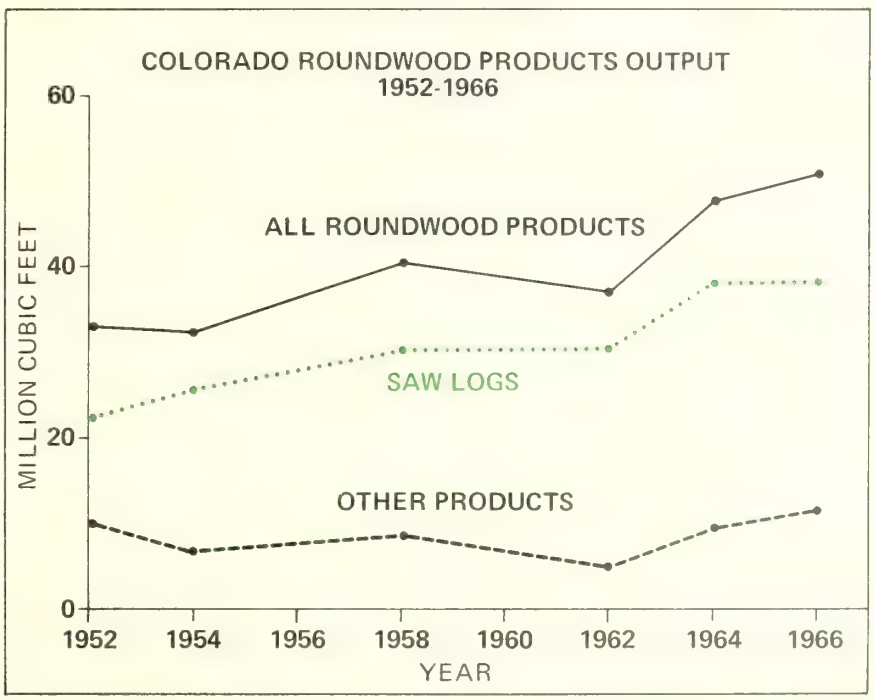


Figure 16

Table 17. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	184,645	252,145	37
Veneer logs	Thousand board feet	--	32,930	--
Pulpwood	Thousand standard cords	3	2	—33
Commercial poles	Thousand pieces	53	45	—15
Posts	Thousand pieces	368	626	70
Mine timbers	Thousand cubic feet	1,411	2,574	82
Miscellaneous industrial wood[1]	Thousand cubic feet	1,316	593	—55
Miscellaneous farm timbers	Thousand cubic feet	373	921	147
Fuelwood	Thousand standard cords	10	9	—10
All products	Thousand cubic feet	36,433	50,879	40

[1] *Includes products such as house logs, excelsior bolts, match stock, and similar items.*

for these other products, as well as for saw logs, are shown in table 17.

More than one-half the counties in Colorado contributed volume to roundwood products output for 1966. Of the 252 MMBF of saw logs harvested from Colorado timberlands, just under 12 percent came from Mineral County and 10 percent from Hinsdale County. Veneer-log output from within the State (33 MMBF) came from Dolores and Montezuma Counties with 65 and 35 percent respectively.

Nearly all products harvested from Colorado timberlands were used by industries within the State. The round pulpwood was exported to the Lake States and a portion of the commercial poles was shipped to Wyoming.

Spruce led all species in product volume

Spruce (mainly Engelmann spruce) led all species in total roundwood production as well as in both saw-log and veneer-log output. Spruce, ponderosa pine, and lodgepole pine accounted for nearly nine-tenths of all roundwood output in 1966 (figure 17). The relative importance of these species is shown as follows:

Species	*All roundwood*	*Saw logs*
	(Percent)	
Spruce	**52**	**60**
Ponderosa pine	**18**	**14**
Lodgepole pine	**17**	**14**
Other species	**13**	**12**
Total	**100**	**100**

Species other than those shown which are of some importance, especially for saw logs, are the true firs and Douglas-fir in that order.

The general increase in roundwood volume from 1962 to 1966 consisted mainly of substantial gains in output of ponderosa pine (123 percent) and spruce (68 percent). The output of lodgepole pine was down 28 percent and Douglas-fir, 16 percent.

National Forests supplied nine-tenths of roundwood volume

The National Forests of Colorado were the source of 46 MMCF, or 91 percent, of the roundwood products in 1966. Other public lands supplied 2.4 MMCF, or about 5 percent, and private lands, 2 MMCF, or 4 percent.

Output from National Forest lands in 1966 increased 56 percent over 1962. Output from all other classes of ownership decreased somewhat from 1962.

Fewer sawmills produced more lumber

Colorado had 116 active sawmills in 1966 as compared to 170 in 1962. Average lumber production per mill has nearly doubled since 1962 and is up to 2.2 MMBF, but is below the Mountain States average of 6.4 MMBF. Table 18 presents production and number of sawmills for selected years. Almost the entire decrease in the total number of active mills occurred in the small size class, with most of these mills going out of business.

Lumber production shown in table 18 resulted from processing of logs imported from other States as well as those from Colorado timberlands. Saw-log imports into Colorado amounted to 22 MMBF, with 64 percent coming from New Mexico and 36 percent from Wyoming. In addition to saw logs, a small number of posts were imported from Wyoming.

Plant byproducts volume increased since 1962

The volume of byproducts in 1966 was 2.5 MMCF. Industrial sources of these materials and types of byproducts are shown in table 19.

The volume of byproducts in 1966 reflects an 80 percent increase over the 1962 volume. Although plant residues increased 25 percent since 1962, to 19.9 MMCF in 1966, there is evidence of better utilization in that wood chips (shipped mainly to Lake States plants) were being produced and increased quantities of residues were being used for fuel. The 1966 residues volume was about equally divided between coarse and fine material.

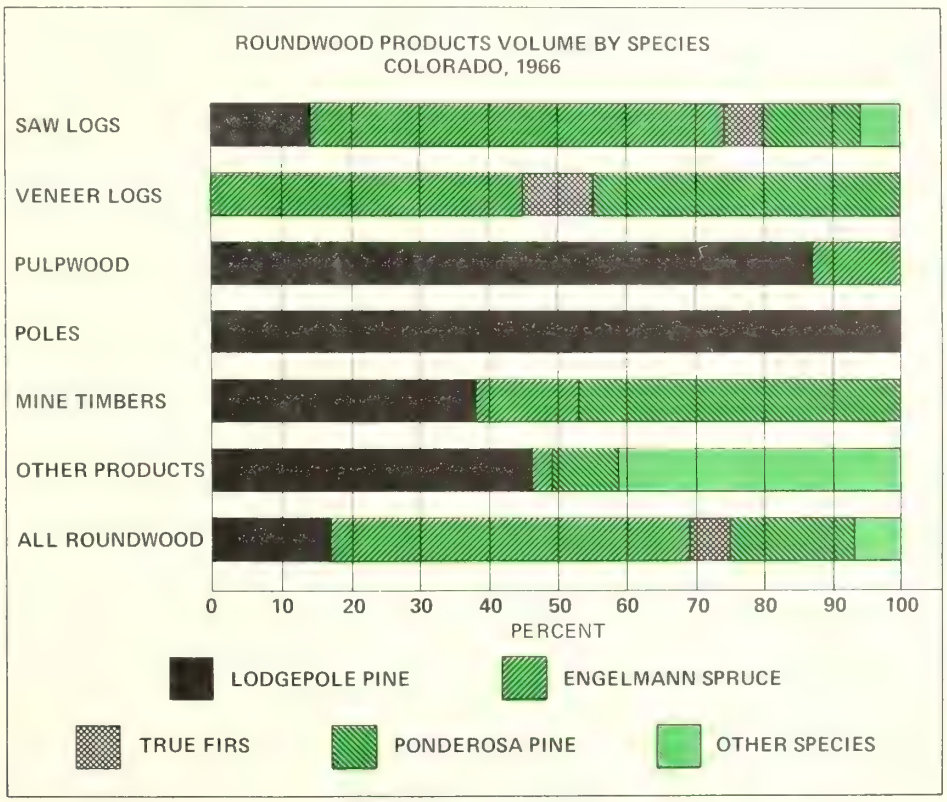


Figure 17

Table 18. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1957 } 1962 }	([2])	([2])	([2])
	1966	7	16.9	47
1 to 10 million	1957	47	2.9	72
	1962	45	3.9	84
	1966	35	3.2	44
Less than 1 million	1957	227	.2	28
	1962	125	.3	16
	1966	74	.3	9

[1] *1957 averages derived from a cooperative lumber survey by the Bureau of the Census and the Intermountain Station; 1962 and 1966 averages obtained by prorating the Bureau of the Census' lumber production figures among mill classes on the basis of the Intermountain Station's surveys of saw-log receipts.*

[2] *To avoid the possibility of disclosing individual operations in 1957 and 1962, data for the few mills in this class were included in the 1 to 10 million class.*

Table 19. — Volume of plant byproducts by industrial source and use class, 1966

Industrial source	All byproducts	Fiber[1]	Industrial fuel	Domestic fuel	Other byproducts[2]
			Million cubic feet		
Lumber industry	2.1	0.2	0.6	0.2	1.1
Plywood industry	.4	0	0	0	.4
Total	2.5	0.2	0.6	0.2	1.5

[1] *Mainly chips and sawdust for pulpwood.*

[2] *Includes livestock bedding, mulch, and small dimension and specialty items.*

Nearly all roundwood products came from growing stock

Over 97 percent (49 MMCF) of Colorado's harvest of roundwood products came from the growing stock inventory on commercial forest land. Cull and dead trees on commercial forest land and harvesting of trees on other lands provided the remaining volume of products. More than 87 percent (49 MMCF) of the total removals from growing stock went into roundwood products. Additional removals from growing stock were in the form of logging residues (8 percent, or 4 MMCF) and other removals through timber-stand improvement operations, land clearing, or changes in land use, estimated to be about 3 MMCF, or 5 percent of all removals from growing stock.

Total sawtimber removals from commercial forest land were 339 MMBF with more than 91 percent (310 MMBF) going into products. Logging residues accounted for 4 percent (12 MMBF), and other removals for about 5 percent (17 MMBF).

Tables 54 through 57, in Appendix B, present additional statistics concerning timber products of Colorado.

NEVADA

Product volume from Nevada timberlands in 1966 was smallest on record for any year

Output of roundwood products from Nevada timberlands in 1966 amounted to 223 MCF which was by far the smallest production of any of the Mountain States. The 1966 product volume for the State was the smallest of any of the years for which estimates are available over the period 1952 to 1966. Although Nevada's year-to-year timber production characteristically has been erratic, there is evidence that output followed a general upward trend from 1952 to 1958 and subsequently declined to less than the volume in 1952 (figure 18).

Sawmills depended on logs from California

Nevada's timber industry is unique in several respects. Although the State has a large area of noncommercial forest that provides small-dimension material such as posts and fuelwood, it has relatively little commercial timberland. Heavy dependence has been placed on California as a source of saw logs. The unsubstantial timber supply situation, together with a small population and relatively limited local demand for wood products, has resulted in a small industry consisting mainly of the two sawmills not far from the California line. In 1966 these mills received their entire volume of saw logs (44.4 MMBF) from

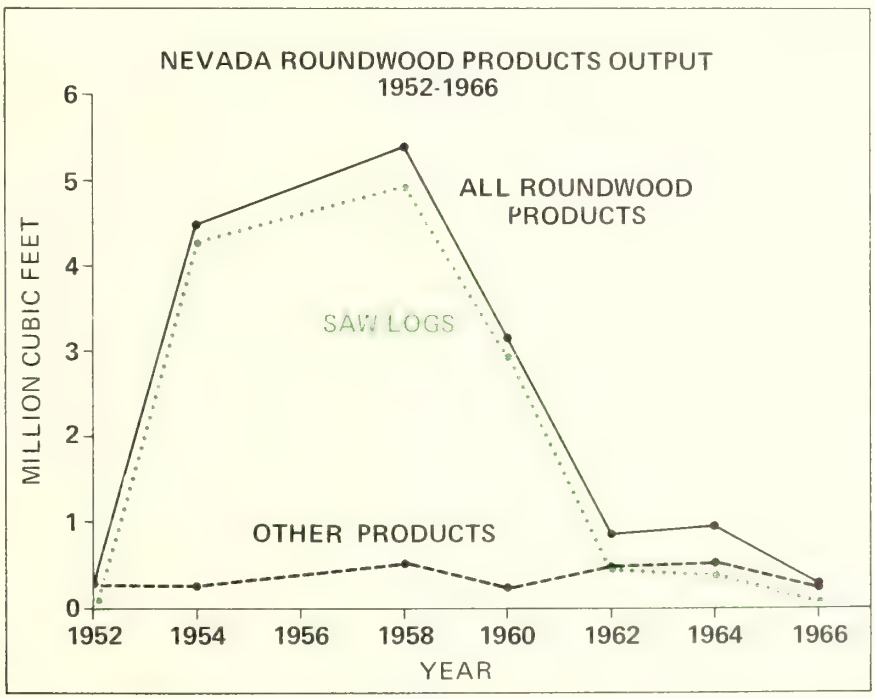


Figure 18

California. Although a small volume of saw logs was harvested in Nevada (11 MBF of ponderosa pine from White Pine County) it was shipped to industry in Utah. As shown by figure 18 saw logs accounted for less than one-half the volume of products harvested from Nevada timberlands in 1962 and succeeding years. In 1966 the volume reported for products other than saw logs consisted of 2,000 cords of fuelwood and 16,000 posts.

The source of the 1966 output of roundwood from Nevada timberlands by land ownership was as follows:

Land ownership class	*MCF*
National Forest	43
Other public	77
Private	103
Total	223

Lumber production shows little recent change; byproduct volume up sharply

Lumber production for Nevada in 1966 is reported by U. S. Bureau of the Census (1968) as 37 MMBF. As shown by the following tabulation of census estimates, this volume lies within the range of output for the preceding 6 years:

Year	*Lumber production (MMBF)*
1960	34
1961	31
1962	37
1963	33
1964	36
1965	39
1966	37

Although the two mills that produced the 37 MMBF in 1966 differed in size, an average of the two (18.5 MMBF) is useful for comparison with similarly derived averages for other Rocky Mountain States. The only State with a higher average was Arizona (19.2 MMBF). The average for all mills in the Rocky Mountain States was 6.4 million.

The volume of plant byproducts amounted to 1.8 MMCF in 1966 — 23 times the estimated output for 1962 — and came entirely from sawmills. Fifty-six percent of the 1966 volume went into industrial fuel, the remainder into pulp chips. Despite the big increase in plant byproducts, unused residues went up from 0.25 MMCF in 1962 to 1.83 million in 1966. The latter volume came entirely from sawmills and about 26 percent consisted of coarse residues (slabs, edgings, and trimmings) and 74 percent fine material (sawdust and shavings).

Only one-third of roundwood output came from growing stock

Of the 223 MCF of roundwood products harvested in Nevada in 1966, only 76 MCF or about one-third of the total came from the growing stock inventory on commercial forest land. The other two-thirds came largely from harvesting on other lands, although there may have been some material from cull and dead trees harvested within the commercial forest.

Total sawtimber removals from commercial forest land were 34 MBF with 97 percent going into products. Logging residues accounted for nearly all the remaining volume.

Tables 58 and 59, in Appendix B, present additional statistics concerning timber products of Nevada.

NEW MEXICO

New Mexico timberlands in 1966 yielded 51 MMCF or 6 percent of the total output from lands within the Mountain States. The output showed an increase of 10 percent over 1962 and was nearly 1.8 times the volume in 1952 (figure 19). In comparison, production for the Mountain States increased 25 percent over the 1962-66 period and 79 percent between 1952 and 1966 (figure 20).

Saw logs accounted for more than four-fifths of roundwood output

The volume of saw-log output in 1966 was 42 MMCF (271 MMBF) which represents an 18 percent increase since 1962. The saw-log output constituted 83 percent of the total roundwood products output in 1966, about 5 percent more than in 1962. Since New Mexico has no plywood or pulp and paper industries, nearly all the remaining 9 MMCF of output (17 percent) consisted of posts, fuelwood, mine timbers, and miscellaneous farm timbers. The output of these products combined decreased 17 percent from 1962 volumes.

Saw logs continued to be the dominant timber product in New Mexico and their production in this State has maintained a fairly steady upward trend; this same trend has occurred in other Mountain States. New Mexico was the only Mountain State, however, to

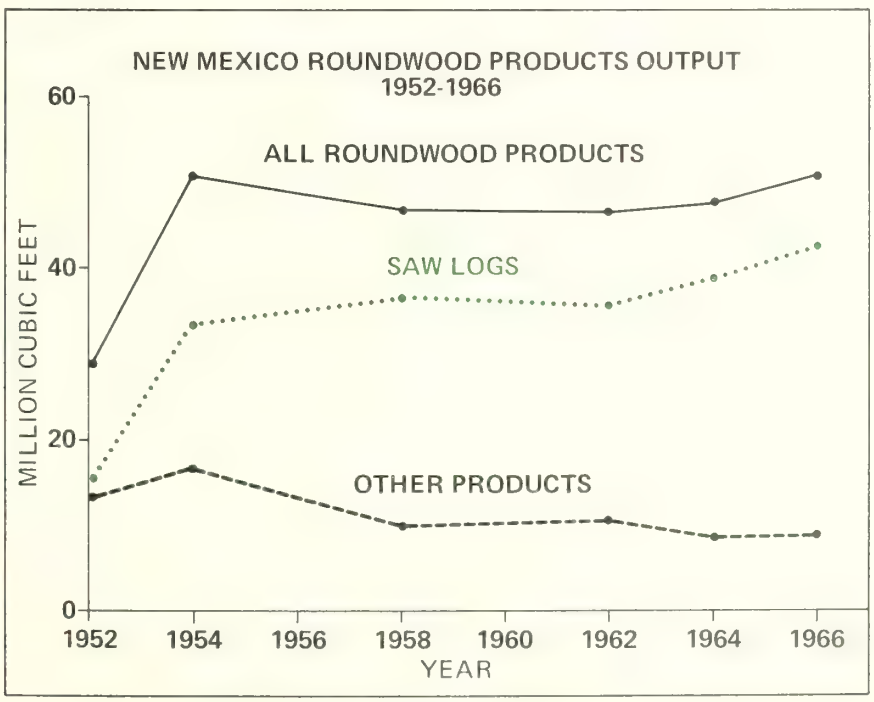


Figure 19

Figure 20. – Saw-log harvesting on the Santa Fe National Forest in New Mexico. Saw logs were the predominant roundwood product in the Rocky Mountain States in 1966. However, the saw-log proportion of the total roundwood output for the Mountain States decreased from 88 percent in 1962 to 80 percent in 1966. New Mexico was the only State in which the proportion of total roundwood used for saw logs increased between 1962 and 1966.

Table 20. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	247,620	271,485	10
Posts	Thousand pieces	235	163	—31
Mine timbers	Thousand cubic feet	410	236	—42
Miscellaneous farm timbers	Thousand cubic feet	183	938	413
Fuelwood	Thousand standard cords	134	85	—37
All products	Thousand cubic feet	[1] 46,259	50,986	10

[1] *Includes small volumes of miscellaneous industrial wood.*

show an increase in the percentage of roundwood output accounted for by saw logs. It was also the only State not showing an increase in the percentage of roundwood output contributed by products other than saw logs. Table 20 shows miscellaneous farm timbers as the only category of roundwood products, with the exception of saw logs, which were more significant in 1966 than in 1962.

Sandoval County contributed by far the largest percentage (27.5 percent) to roundwood output from New Mexico timberlands. Leading counties and the percentages contributed are as follows:

County	*Percent*
Sandoval	27.5
McKinley	15.2
Colfax	13.6
Catron	10.6
All other counties	33.1
	100.0

About 14 MMBF of saw logs produced in New Mexico were exported to Colorado, leaving roughly 95 percent of the output for processing within the State.

Output was predominantly from ponderosa pine and public lands

Ponderosa pine, with 25 MMCF harvested for roundwood products, was by far the leading species in 1966. Other important species contributing to total roundwood output were Douglas-fir (9 million), spruce (7 million), and true firs (2 million). See figure 21.

Most species showed increases in volume harvested in 1966 compared to 1962; true firs led with a 42 percent increase. Douglas-fir and ponderosa pine followed with 24 and 10 percent increases, respectively. Spruce showed an 8 percent decline.

Public lands of New Mexico, principally National Forests and Navajo Indian Reservation lands, were the source of 29 MMCF of roundwood products in 1966, representing 57 percent of the total roundwood products output. Private lands supplied 22 MMCF or 43 percent. Output from National Forests in 1966 increased 31 percent to 26 MMCF as compared to 1962. Output from private ownership classes was down somewhat.

Sawmills decreased in number but showed an increase in average production

The number of active sawmills in New Mexico in 1966 decreased to 64 from the 85 mills active in 1962. The average production of the 64 mills was 4.1 MMBF as compared to the Mountain States average of 6.4 million for 1966. In comparison, average production of New Mexico's 85 mills in 1962 was 2.9 MMBF, and of the 117 mills in 1960, 1.9 million.

Table 21. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1960 } 1962 }	([2])	([2])	([2])
	1966	6	27.2	62
1 to 10 million	1960	37	5.2	85
	1962	31	7.3	93
	1966	17	5.1	33
Less than 1 million	1960	80	.4	15
	1962	54	.3	7
	1966	41	.3	5

[1] *1960 averages derived from a cooperative lumber survey by the Bureau of the Census and the Intermountain Station; 1962 and 1966 averages obtained by prorating the Bureau of the Census' lumber production figures among mill classes on the basis of the Intermountain Station's surveys of saw-log receipts.*

[2] *To avoid the possibility of disclosing individual operations in 1960 and 1962, data for the few mills in this class were included in the 1 to 10 million class.*

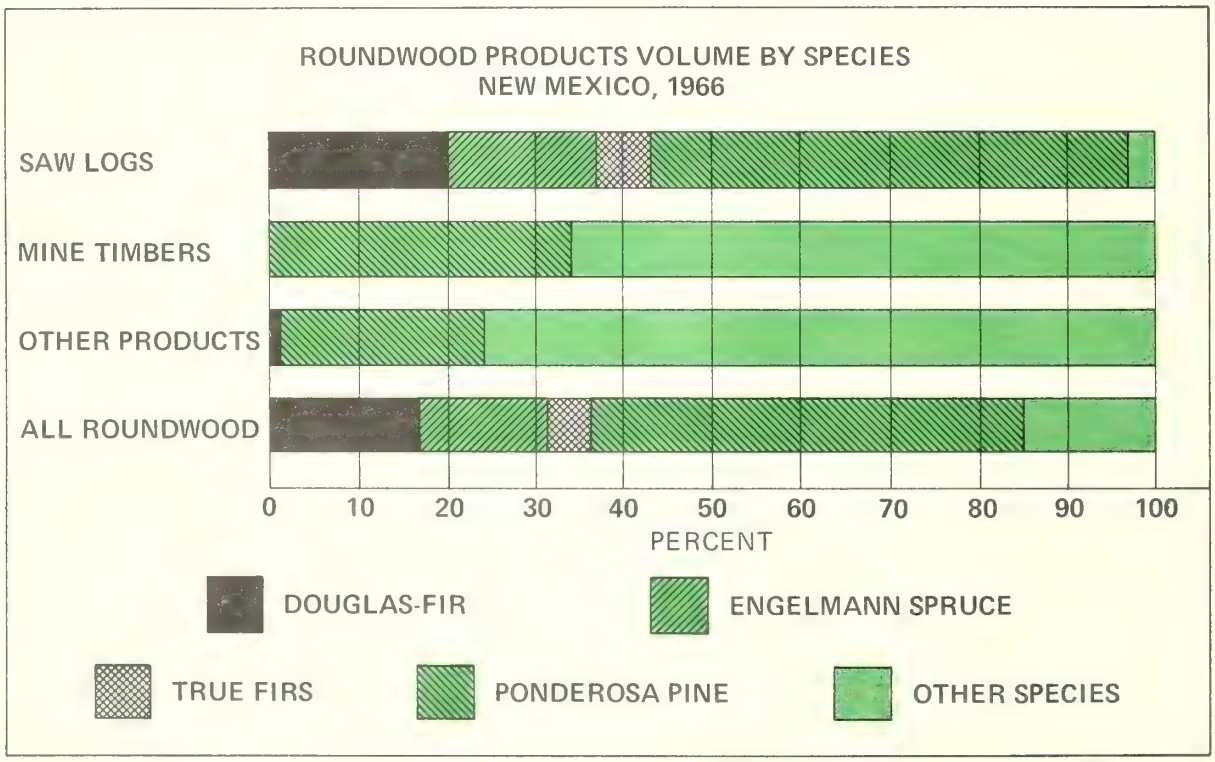


Figure 21

Information regarding the number of active sawmills and average production per mill for selected years is given in table 21.

Log receipts at New Mexico mills in 1966 included 4.6 MMBF received from Arizona. The volume of saw-log imports was considerably less than the 14.4 MMBF indicated earlier as exported to Colorado and represents less than 2 percent of the total saw-log receipts.

Volume of plant byproducts increased; residue volume decreased

The 1966 volume of plant byproducts amounted to 6.1 MMCF, all from the lumber industry. Distribution of this volume by type of product is as follows:

Byproduct	*MCF*
Wood chips for pulp	4,501
Industrial fuel	1,314
Domestic fuel	68
Other[1]	237

[1] *Includes such byproducts as livestock bedding, mulch, and small dimension and specialty items.*

The 1966 volume of byproducts represents slightly more than three times the volume produced in 1962. This increased utilization, especially the production of wood chips (shipped mainly to Arizona), partially explains the reduction in plant residues from 18 MMCF in 1962 to 16 million in 1966. Between 1962 and 1966, coarse residues showed a reduction of 30 percent, while fine residues increased about 7 percent.

Nearly all roundwood products were cut from growing stock

Of the total volume of roundwood products harvested in New Mexico in 1966, 84 percent, or 43 MMCF, came from the growing stock inventory on commercial forest land. The remaining 16 percent of roundwood products came from harvesting of trees on other lands and from cull and dead trees on commercial forest land.

Eighty-seven percent of the total removals from growing stock went into roundwood products. Additional removals from growing stock were in the form of logging residues (10 percent, or 5.1 MMCF) and other removals through timber-stand improvement operations, land clearing, or changes in land use, estimated to be 1.3 MMCF, or 3 percent of all removals from growing stock.

Total sawtimber removals from commercial forest land were 290 MMBF with 92 percent (266 MMBF) going into products; logging residues accounted for 5 percent (16 MMBF), and other removals for 3 percent (8 MMBF).

Tables 60 through 62, in Appendix B, present additional statistics concerning timber products of New Mexico.

UTAH

Output of roundwood products from Utah timberlands in 1966 amounted to 14 MMCF; this volume was less than 2 percent of the total obtained from all lands within the Mountain States. Production showed an increase of 17 percent over 1962 and was a little more than double the 1952 volume (figure 22). In comparison, production for the Mountain States increased 25 percent over the 1962-1966 period and 79 percent between 1952 and 1966.

Saw logs accounted for most of product volume; all products increased since 1962

The 1966 saw-log volume of 12.1 MMCF (77.8 MMBF) constituted 86 percent of the total volume of roundwood products. The remainder of the volume consisted of mine and farm timbers, posts, fuelwood, and miscellaneous industrial wood. Statistics on output for selected years during the period of 1952-1966 indicate that saw-log output has pretty much paralleled total roundwood output (figure 22); from 1960 on, saw logs have comprised more than 85 percent of the volume. Table 22 indicates that all products showed an increased volume in 1966 as compared with 1962, and that percentagewise most products increased to a greater extent than saw logs.

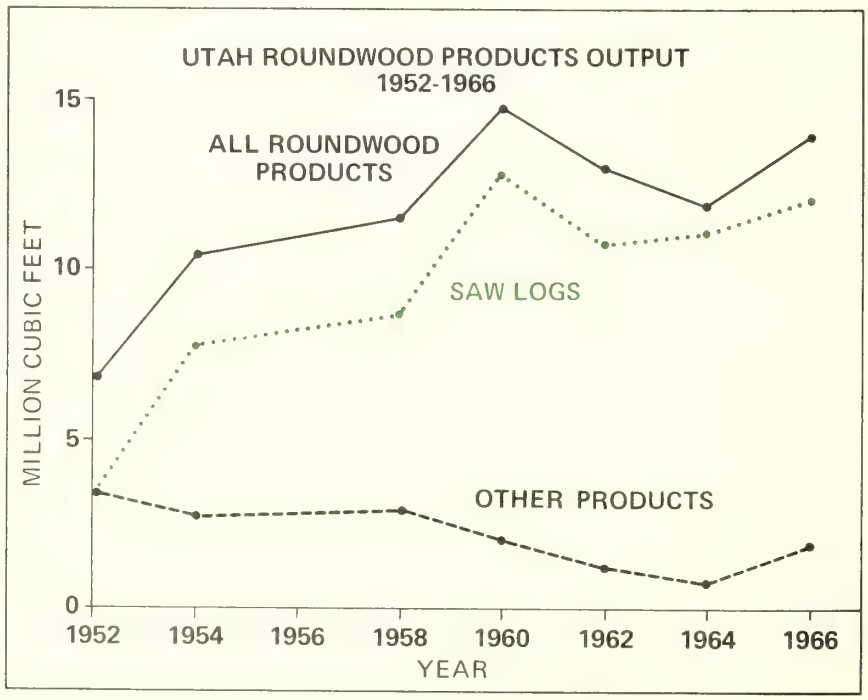


Figure 22

Table 22. — Roundwood products output, 1962 and 1966, and percent change

Product	Unit of measure	1962	1966	Percent change
Saw logs	Thousand board feet	64,938	77,750	20
Posts[1]	Thousand pieces	16	60	275
Mine timbers	Thousand cubic feet	245	455	86
Miscellaneous industrial wood[2]	Thousand cubic feet	703	735	5
Miscellaneous farm timbers	Thousand cubic feet	88	306	248
Fuelwood	Thousand standard cords	1	4	300
All products	Thousand cubic feet	12,005	14,030	17

[1] *Includes commercial poles to avoid disclosure of individual operations.*
[2] *Includes products such as converter poles, excelsior bolts, and similar items.*

Two counties provided the major portion of the saw-log output from Utah timberlands — San Juan (32.1 percent) and Garfield (31.5 percent). Duchesne County with 11.4 percent was third.

Except for 1.5 MMBF of logs exported to mills in Wyoming, all material harvested in Utah was processed by industries within the State.

Product volume was one-half ponderosa pine and mainly from National Forest lands

Ponderosa pine was by far the leading species and constituted one-half of the total cubic volume of roundwood. Other leading species were Engelmann spruce (19 percent) and lodgepole pine (18 percent). Important differences occurred among individual products or product groups with respect to relative significance of species, as shown in table 23.

Ponderosa pine made the greatest gain in recent years — about three times the 1962 volume was harvested in 1966. Lodgepole pine increased 22 percent but Engelmann spruce decreased 34 percent, and the combined volume of other species dropped 48 percent.

Table 23. — Percent distribution of roundwood products by species, 1966

Product	Engelmann spruce	Lodgepole pine	Ponderosa pine	Other species	Total all species
	Percent				
Saw logs	20	12	57	11	100
Mine timbers	9	87	1	3	100
Miscellaneous industrial wood	28	47	0	25	100
Posts, fuelwood, misc. farm timbers	1	43	2	54	100
All products	19	18	50	13	100

Table 24. — Active sawmills and average annual production by production class

Production class (BF/yr.)	Year	Active sawmills	Average annual production[1]	Total lumber production
		Number	*MMBF*	*Percent*
10 million and more	1960 } 1962 }	([2])	([2])	([2])
	1966	2	19.8	55
1 to 10 million	1960	12	3.9	68
	1962	17	3.4	86
	1966	11	2.3	35
Less than 1 million	1960	87	.3	32
	1962	56	.2	14
	1966	37	.2	10

[1] *1960 averages derived from a cooperative lumber survey by the Bureau of the Census and the Intermountain Station; 1962 and 1966 averages obtained by prorating the Bureau of the Census' lumber production figures among mill classes on the basis of the Intermountain Station's surveys of saw-log receipts.*

[2] *To avoid the possibility of disclosing individual operations in 1960 and 1962, data for the few mills in this class were included in the 1 to 10 million class.*

Ninety percent of the product volume came from National Forest lands. State, Indian, and Bureau of Land Management lands provided 4 percent and private lands 6 percent.

Number of sawmills continued to decline; production increased

The trend over recent years towards fewer mills but greater average production per mill continued in 1966. Average production of the 50 mills active in 1966 was 1.44 MMBF. In comparison, average production of the 73 mills in 1962 was 0.92 million feet, and of the 99 mills in 1960, 0.70 million feet. As a further comparison, average production of all mills in the Mountain States in 1966 was 6.4 MMBF. Table 24 permits comparisons for 1960, 1962, and 1966 of Utah mills by selected size-class groupings.

Log receipts at Utah mills consisted almost entirely of material harvested from timberlands within the State. A very small volume (11 MBF) was imported from Nevada.

Plant byproducts and residues both increased

The volume of plant byproducts in 1966 amounted to 0.5 MMCF. About 88 percent of this material was used for livestock bedding, mulch, and small dimension and specialty items; the remainder was industrial and domestic fuelwood.

Production of plant byproducts has never been a significant feature of Utah timber industries. No volume was reported for 1962, although some material undoubtedly was used for fuelwood. The lack of a nearby market for pulp chips has been a handicap. No output of chips was reported for 1966, but subsequent production by at least one mill is expected to increase the volume of plant byproducts in future years.

Six MMCF of residue resulted from processing of roundwood by Utah timber industries in 1966. Roughly one-half of this volume was coarse residues (slabs, edgings, and trimmings) and one-half fine material (sawdust and shavings). Ninety-five percent of the residue volume resulted from lumber production, the remainder from the variety of miscellaneous timber industries. In comparison with 1962, residue volume was up 29 percent. This contrasts with a 19 percent reduction for the Mountain States area over the same period.

Bulk of product volume came from growing stock inventory

Of the total volume of roundwood products harvested in Utah in 1966, 94 percent, or 13 MMCF, came from the growing stock inventory on commercial forest land. Cull and dead trees on commercial forest land and timber harvesting on other lands accounted for the remaining 6 percent.

Eighty-five percent of the total removals from growing stock went into roundwood products; the remainder (2.3 MMCF) was logging residues and trees lost from inventory as a result of timber-stand improvement operations, land clearing, and changes in land use.

Total sawtimber removals from commercial forest land were 85 MMBF with 89 percent (75 MMBF) going into products. Logging residues and other removals accounted for the remaining volume.

Tables 63 through 65, in Appendix B, present additional statistics concerning timber products of Utah.

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APPENDIX A

Terminology Survey Methods and Reliability of Data

Terminology

Cull Tree

Live tree of sawtimber or poletimber size that is unmerchantable for saw logs, now or prospectively, because of rot or other defect, or species.

Forest Land

Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparison of basal area and/or number of trees, by age or size and spacing with specified standards. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet in width.)

The principal classes of forest land are:

Commercial forest land. — Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying as commercial forest land have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Noncommercial forest land. — (1) Unproductive forest land incapable of yielding crops of industrial wood, because of adverse site conditions, and (2) productive-reserved forest land.

Growing Stock Trees

Live trees of commercial species qualifying as desirable or acceptable trees. (Note: Excludes rough, rotten, and dead trees.)

Growing Stock Volume

Net volume in cubic feet of growing stock trees 5.0 inches d.b.h. and over from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Hardwoods

Dicotyledonous trees, usually broad-leaved and deciduous.

Industrial Wood

All roundwood products, except fuelwood.

Logging Residues from Growing Stock

The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging on commercial forest land and not converted to timber products.

Other Removals

The net volume of growing stock trees removed from the inventory by cultural operations, such as timber-stand improvements, land clearing, and changes in land use.

Ownership

Property owned by one owner, regardless of the number of parcels in a specified area.

Ownership Classes

National Forest lands. — Federal lands which have been legally designated by Executive order or statute as National Forests or purchase units, and other lands under the administration of the USDA Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Other public lands. — Federal lands other than National Forests, including lands administered by the Bureau of Land Management, Bureau of Indian Affairs, and miscellaneous Federal agencies. Also, lands owned by States, counties, and local public agencies, or lands

leased by these governmental units for more than 50 years.

Forest industry lands. — Lands owned by companies or individuals operating wood-using plants.

Other private lands. — Privately owned lands other than forest industry lands.

Plant Byproducts

Wood products, such as pulp chips, obtained incidental to production of other manufactured products.

Plant Residues

Wood materials from manufacturing plants not utilized for some product. (Note: Includes slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screenings.)

Poletimber Tree

Growing stock trees of commercial species at least 5.0 inches d.b.h., but smaller than sawtimber size.

Principal Tree Species

Softwoods

Douglas-fir	*Pseudotsuga menziesii*
Fir, subalpine	*Abies lasiocarpa*
Fir, corkbark	*A. lasiocarpa* var. *arizonica*
Fir, grand	*A. grandis*
Fir, white	*A. concolor*
Hemlock, mountain	*Tsuga mertensiana*
Hemlock, western	*T. heterophylla*
Juniper	*Juniperus* spp.
Larch, western	*Larix lyallii*
Pine, limber	*Pinus flexilis*
Pine, lodgepole	*P. contorta*
Pine, ponderosa	*P. ponderosa*
Pine, western white	*P. monticola*
Pine, whitebark	*P. albicaulis*
Pine, pinyon	*P.* spp.
Redcedar, western	*Thuja plicata*
Spruce, Engelmann	*Picea engelmannii*
Spruce, blue	*P. pungens*
Spruce, white	*P. glauca*

Hardwoods

Aspen, quaking	*Populus tremuloides*
Cottonwood	*P.* spp.
Birch, paper	*Betula papyrifera*

Roundwood Products

Logs, bolts, or other round sections cut from trees for industrial or consumer uses. (Note: Includes saw logs; veneer logs and bolts; cooperage logs and bolts; pulpwood; fuelwood; pilings; poles; posts; hewn ties; mine timbers; and various other round, split, or hewn products.)

Saw Log

A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight and with a minimum diameter inside bark for softwoods of 6 inches (8 inches for hardwoods) or other combinations of size and defect specified by Regional standards.

Sawtimber Trees

Live trees of commercial species containing at least a 12-foot saw log and meeting Regional specifications for freedom from defect. Softwoods must be at least 9.0 inches in diameter breast height, except in California, Oregon, Washington, and coastal Alaska where the minimum diameter is 11.0 inches. Hardwoods must be at least 11.0 inches in diameter in all States.

Sawtimber Volume

Net volume of the saw-log portion of live sawtimber in board feet, International 1/4-inch rule.

Softwoods

Coniferous trees, usually evergreen having needles or scalelike leaves.

Timber Products

Roundwood products and plant byproducts. (Note: Timber products output includes

roundwood products cut from growing stock on commercial forest land; from other sources, such as cull trees, salvable dead trees, limbs, and saplings; from trees on noncommercial and nonforest lands, and from plant byproducts.)

Timber Removals

The net volume of growing stock trees removed from the inventory by harvesting; cultural operations, such as timber-stand improvement; land clearing; or changes in land use.

Survey Methods and Reliability of Data

The 1966 survey of saw-log receipts was based on a listing of sawmills in the Rocky Mountain States prepared early in 1967, and made as complete as possible through reviews by Forest Service and State forestry personnel. Operators of all listed mills were contacted by mail to obtain their saw-log receipts for 1966. Also, sawmills outside the Rocky Mountain States considered as possible recipients of logs from the Rocky Mountain States were asked to report. Field sampling provided data for estimating, within acceptable error limits, the receipts of sawmill operators who did not furnish mail reports (nonrespondents).

The half-confidence intervals for estimates of 1966 State totals are shown below. The true totals are predicted to lie within plus or minus their respective half-confidence intervals of the estimated totals. The odds are two to one that the confidence interval prediction is correct.

State	*Half-confidence interval for ... Mbf*	*Half-confidence interval of total saw-log receipts (Percent)*
Idaho	7,636	0.46
Montana	12,153	.97
Western South Dakota	963	2.17
Wyoming	6,050	3.49
Arizona	([1])	0
Colorado	7,875	3.12
Nevada	([1])	0
New Mexico	3,768	1.39
Utah	409	.53

[1] *Reports obtained from all mills.*

All veneer and plywood plants known to receive veneer logs from the Rocky Mountain States were contacted by mail to obtain their veneer log receipts. Nonrespondents were contacted in the field. Estimates for veneer-log receipts in Colorado and Idaho are considered to be without sampling error since reports were obtained from all plants. The estimated total volume of veneer-log receipts from Montana plants was 183,449 MBF. Sixty-six percent of this volume was reported directly from five of the six plants operating in the State in 1966. The volume of receipts for the remaining plant was an estimate based on 1966 plywood production figures for the plant.

Reports were obtained by mail, and field contacts were made with all nonrespondent plants known to receive round pulpwood, commercial poles, and miscellaneous industrial wood from the Rocky Mountain States in 1966. Estimates for these products are considered to be without sampling error.

Estimates for 1966 production of posts, fuelwood, and miscellaneous farm timbers were derived from reports furnished by National Forests, State forestry offices, Bureau of Land Management, Bureau of Indian Affairs, and Bureau of Reclamation. These estimates were supplemented by trend estimates from U. S. Bureau of Census publications showing farm use of these products. Since this procedure precluded the computation of a sampling error by the methods used for other products, no error estimates have been assigned.

Procedures for the survey of round mine timbers received at Rocky Mountain States mines were similar to those used for saw-log receipts. Mail contacts were made from lists of mine operators compiled from reports of State mine inspectors, State mining bureaus, and State industrial commissions. The Mining World Directory of Major United States Mining Operations was also used. Nonrespondents were sampled by field contacts. The half-confidence intervals for estimates of 1966 State totals are shown below. The true totals are predicted to lie within plus or minus their respective half-confidence intervals of the estimated totals. The odds are two to one that the confidence interval prediction is correct.

State	Half confidence interval for round mine timbers	Half-confidence interval of total round mine timber receipts
	(MBF)	(Percent)
Idaho	([1])	0
Montana	9,511	.32
Western South Dakota	([1])	0
Wyoming	176	.04
Arizona	([1])	0
Colorado	77,810	3.02
Nevada	([2])	0
New Mexico	([1])	0
Utah	5,712	1.25

[1] *All field sample mines contacted reported no round mine-timber receipts.*

[2] *No round mine-timber receipts reported.*

APPENDIX B

Tables 25-65

ROCKY MOUNTAIN STATES

Table 25. — *Output of roundwood products from timberlands of the Rocky Mountain States by product and State, 1966*

State	Total output all products	Products						
		Saw logs	Veneer logs	Pulpwood	Commercial poles[1]	Mine timbers	Miscellaneous[2] industrial wood	Posts, fuelwood miscellaneous farm timbers
	Thousand cubic feet							
Idaho	316,188	259,806	39,236	9,173	3,571	142	751	3,510
Montana	238,231	195,603	27,884	3,753	2,472	2,974	256	5,289
W. South Dakota	15,859	6,912	--	4,645	--	1	--	[3]4,301
Wyoming	33,523	27,065	--	141	3,616	478	28	2,195
Arizona	89,873	62,437	--	6,647	335	22	86	20,346
Colorado	50,879	39,335	5,005	201	837	2,574	593	2,334
Nevada	223	2	--	--	--	--	--	221
New Mexico	50,986	42,352	--	--	--	236	--	8,398
Utah	14,030	12,129	--	--	--	455	735	[3]711
Total	809,792	645,641	72,125	24,559	10,831	6,882	2,449	47,305

[1] Includes a small amount of piling.

[2] Includes house logs, converter poles, shingle bolts, excelsior bolts, match stock, charcoal wood, and similar items.

[3] Includes a small volume of commercial poles to avoid disclosure of individual operations.

Table 26. — *Output of roundwood products from timberlands in the Rocky Mountain States by product, species group, and State, 1966*

(In standard units)

State	Saw logs			Veneer logs			Mine timbers			Miscellaneous industrial wood[1]			Miscellaneous farm timbers		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	Thousand board feet[3]									Thousand cubic feet					
Idaho	1,665,425	1,665,172	253	258,129	256,977	1,152	142	142	--	751	751	0	1,525	1,525	--
Montana	1,253,868	1,253,543	325	183,449	182,304	1,145	2,974	2,974	--	256	256	0	3,027	3,027	--
W. South Dakota	44,308	44,308	--	0	0	0	1	1	--	--	--	--	447	447	--
Wyoming	173,491	173,491	--	0	0	0	478	478	(6/)	28	28	0	1,768	1,698	70
Arizona	400,236	399,564	672	0	0	0	22	(6/)	22	86	8	78	556	556	--
Colorado	250,145	246,100	4,045	32,930	32,838	92	2,574	2,571	3	593	29	564	921	921	--
Nevada	11	11	0	0	0	0	--	--	--	--	--	--	--	--	--
New Mexico	271,485	267,033	4,452	0	0	0	236	81	155	--	--	--	938	938	--
Utah	77,750	75,381	2,369	0	0	0	455	453	2	735	735	0	306	306	--
Total	4,138,719	4,124,603	14,116	474,508	472,119	2,389	6,882	6,700	182	2,449	1,807	642	9,488	9,418	70

State	Pulpwood			Fuelwood			Commercial poles[2]			Posts		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	Thousand standard cords								Thousand pieces			
Idaho	107	105	2	15	15	(4/)	[illegible]	[illegible]	0	699	699	0
Montana	44	44	0	8	8	--	133	133	0	1,569	1,569	0
W. South Dakota	54	54	0	8	8	--	[illegible]	[illegible]	0	1,994	1,994	0
Wyoming	2	2	0	2	2	--	[illegible]	[illegible]	0	292	292	0
Arizona	77	77	0	226	226	--	[illegible]	[illegible]	0	398	398	0
Colorado	2	2	0	9	9	(4/)	[illegible]	[illegible]	0	626	621	5
Nevada	0	0	0	2	2	--	[illegible]	[illegible]	0	16	16	(7/)
New Mexico	--	--	--	85	85	--	[illegible]	[illegible]	0	163	163	0
Utah	0	0	0	4	4	(4/)	[illegible]	[illegible]	0	60	60	0
Total	286	284	2	359	359		645	645	0	5,817	5,812	5

1/ Includes house logs, converter poles, shingle bolts, excelsior bolts, match stock, charcoal wood, and similar items.

2/ Includes a small amount of piling.

3/ International 1/4-inch log rule.

4/ Less than 0.5 M standard cords.

5/ Data for Wyoming and South Dakota combined to avoid revealing individual operations.

6/ Less than 0.5 MBF.

7/ Less than 0.5 M pieces.

Table 27. — *Output of roundwood products from timberlands of the Rocky Mountain States by species and State, 1966*

State	All species	Species								
		Ponderosa pine	Douglas-fir	Engelmann spruce[1]	True firs[2]	Lodgepole pine	Western larch	Western white pine[3]	Other[4]	All hardwoods
	Thousand cubic feet									
Idaho	316,185	46,012	65,954	16,061	61,897	9,964	26,610	61,978	27,337	375
Montana	238,231	36,141	80,731	26,199	5,865	32,387	45,832	5,802	5,049	225
W. South Dakota	15,859	15,447	--	412	--	--	0	0	--	--
Wyoming	33,523	6,995	1,076	4,965	695	19,742	0	0	70	70
Arizona	89,873	62,372	6,442	693	3,810	0	0	0	16,345	205
Colorado	50,879	9,338	1,220	26,481	3,015	8,730	0	0	534	1,569
Nevada	223	24	--	--	23	--	0	--	176	(5/)
New Mexico	50,986	25,047	8,570	7,214	2,442	--	0	0	6,862	851
Utah	14,030	6,976	485	2,619	524	2,516	0	0	367	543
Total	809,792	208,352	164,480	84,644	78,187	73,329	72,442	67,780	56,740	3,838

1/ Includes blue and white spruce.

2/ Includes grand, white, subalpine, and corkbark firs.

3/ Includes a small amount of limber and whitebark pines.

4/ Includes principally western redcedar, western hemlock, pinyon pine, and juniper.

5/ Less than 0.5 MCF.

Table 28. — *Output of roundwood products from timberlands of the Rocky Mountain States by land ownership class and State, 1966*

State	Land ownership classes				
	National Forest	Other public	Forest industry	Other private	All ownerships
	Thousand cubic feet				
Idaho	173,318	36,304	70,578	35,988	316,188
Montana	141,431	22,108	39,331	35,361	238,231
W. South Dakota	13,221	1,036	1,057	545	15,859
Wyoming	31,023	1,145	--	1,359	33,527
Arizona	67,197	21,477	1,060	139	89,873
Colorado	46,198	2,420	263	1,998	50,879
Nevada	43	77	--	103	223
New Mexico	26,152	5,023	7,074	14,737	53,986
Utah	12,017	576	(1/)	537	14,030
Total	511,600	85,166	119,363	91,067	809,792
Percent	63.13	10.89	14.74	11.24	100.00

1/ Less than 0.5 MCF.

Table 29. — *Number and log receipts[1] of active sawmills in the Rocky Mountain States, by mill size class[2] and State, 1966*

State	All mills		Small mills				Medium mills				Large mills			
	Number	Average per mill	Number	Receipts: Volume	Receipts: Percent of total	Average per mill	Number	Receipts: Volume	Receipts: Percent of total	Average per mill	Number	Receipts: Volume	Receipts: Percent of total	Average per mill
		MBF		MBF		MBF		MBF		MBF		MBF		MBF
Idaho	[illegible]	9,681	77	15,033	[illegible]	[illegible]	[illegible]	184,7[illegible]	11	4,[illegible]16	45	1,4[illegible],71[illegible]	89	31,038
Montana	148	8,477	86	42,370	4	574	[illegible]	[illegible],[illegible]80	[illegible]	3,027	37	1,124,956	90	30,393
W. South Dakota	[illegible]1	[illegible],047	14	3,866	[illegible]	[illegible]	[illegible]	1[illegible],8[illegible]0	[illegible]4	[illegible],104	2	29,344	[illegible]7	14,672
Wyoming	65	[illegible],575	42	9,257	5	[illegible]21	[illegible]9	[illegible]0,[illegible]04	48	4,212	4	78,057	47	19,514
Arizona	23	17,205	5	1,360	(3/)	[illegible]73	[illegible]	41,330	11	5,167	10	353,002	89	35,300
Colorado	116	2,307	74	25,731	[illegible]	[illegible]48	[illegible]8	[illegible]2,[illegible]56	44	5,456	7	127,880	47	18,269
Nevada	2	22,217	0	0	0	[illegible]	1	4,[illegible]2	9	4,022	1	40,412	91	40,412
New Mexico	[illegible]4	4,107	41	13,343	5	325	[illegible]7	[illegible]7,50[illegible]	33	5,169	6	161,617	62	26,936
Utah	50	1,555	37	7,638	10	[illegible]06	11	[illegible]7,[illegible]81	35	2,480	2	42,842	55	21,421
Mountain States	657	6,313	376	128,830	3	342	167	637,712	15	3,819	114	3,381,424	82	29,662

1/ International 1/4-inch log rule.

2/ Small mill: less than 1 MMBF per year; medium: 1 to 10 MMBF; large: more than 10 MMBF per year.

3/ Less than 0.5 percent.

Table 30. — *Estimated volume of plant residues[1] in the Rocky Mountain States, by industrial source, type of material, and State, 1966*

State	All industries			Lumber industry			Veneer and plywood industry			Other primary industries		
	Total	Coarse[2]	Fine[3]	Total	Coarse[2]	Fine[3]	Total	Coarse[2]	Fine[3]	Total	Coarse[2]	Fine[3]
	Thousand cubic feet											
Idaho	56,363	23,245	33,118	55,445	22,808	32,637	122	122	0	796	315	481
Montana	38,011	12,653	25,358	36,924	11,858	25,066	657	657	0	430	138	292
W. South Dakota	2,224	741	1,483	[illegible]	[illegible]	1,375	[illegible]	0	0	162	54	108
Wyoming	11,943	5,433	[illegible]	11,743	5,337	6,406	0	0	0	1,200	596	604
Arizona	13,235	4,741	8,494	13,160	4,714	8,446	0	0	0	75	27	48
Colorado	19,800	10,62[illegible]	[illegible],244	18,000	[illegible],022	8,084	1,339	1,339	0	521	261	260
Nevada	[illegible],732	[illegible]472	1,[illegible]60	1,[illegible]2	[illegible]47	1,[illegible]	[illegible]	0	0	0	0	0
New Mexico	15,[illegible]1[illegible]	[illegible],87[illegible]	[illegible],043	15,913	[illegible],870	1[illegible],043	[illegible]	0	0	0	[illegible]	[illegible]
Utah	[illegible],0[illegible]0	[illegible],[illegible]4[illegible]	[illegible],[illegible]02	[illegible],[illegible]4[illegible]	[illegible],[illegible]93	2,749	[illegible]	[illegible]	0	308	155	153
[illegible]tal	[illegible],[illegible]4[illegible]	[illegible],325	9[illegible],1[illegible]	159,877	[illegible],6[illegible]	[illegible],21[illegible]	2,118	2,118	0	3,462	1,548	1,916

[1] Unused plant residues at primary manufacturing plants; i.e., do not include primary plant waste that is subsequently used for fuel or fiber (pulp or particle board).

[2] Unused material suitable for chipping, such as slabs, edgings, veneer cores, and trimmings.

[3] Unused material such as sawdust and shavings.

Table 31. — *Output of plant byproducts in the Rocky Mountain States by industrial source, type of material, and State, 1966*

State	All industries[1]					Lumber industry					Veneer and plywood industry				
	Total	Fiber[2]	Industrial fuel	Domestic fuel	Other[3]	Total	Fiber[2]	Industrial fuel	Domestic fuel	Other[3]	Total	Fiber[2]	Industrial fuel	Domestic fuel	Other[3]
	Thousand cubic feet														
Idaho	92,167	53,281	28,501	512	9,873	79,002	42,333	28,361	496	7,812	13,165	10,948	140	16	2,061
Montana	73,494	42,212	26,622	997	3,663	64,705	34,012	26,394	696	3,603	8,789	8,200	228	301	60
W. South Dakota	1,533	811	558	48	116	1,533	811	558	48	116	0	0	0	0	0
Wyoming	3,313	2,928	165	137	83	3,313	2,928	165	137	83	0	0	0	0	0
Arizona	19,309	10,863	8,261	36	149	19,309	10,863	8,261	36	149	0	0	0	0	0
Colorado	2,499	231	596	194	1,478	2,143	231	596	194	1,122	356	0	0	0	356
Nevada	1,772	788	984	0	0	1,772	788	984	0	0	0	0	0	0	0
New Mexico	6,120	4,501	1,314	68	237	6,120	4,501	1,314	68	237	0	0	0	0	0
Utah	535	0	12	54	469	535	0	12	54	469	0	0	0	0	0
Total	200,742	115,615	67,013	2,046	16,068	178,432	96,467	66,645	1,729	13,591	22,310	19,148	368	317	2,477

[1] The lumber, veneer, and plywood industries are the only ones with significant plant byproducts.

[2] Mainly chips and sawdust used for pulpwood.

[3] Includes livestock bedding, mulch, and small dimension and speciality items.

Table 32. — *Removals from growing stock in the Rocky Mountain States by roundwood products, logging residues, and other means, by State, 1966*

State	Total removals	Products								Logging residues	Other removals
		All products	Saw logs	Veneer logs	Pulpwood	Commercial poles	Mine timbers	Miscellaneous industrial wood[1]	Posts, fuelwood miscellaneous farm timbers		
	Thousand cubic feet										
Idaho	338,508	301,930	249,414	39,236	7,536	3,571	142	595	1,436	36,034	544
Montana	270,555	233,369	193,647	27,884	3,148	[2]2,472	2,974	248	2,996	36,860	326
W. South Dakota	15,775	14,923	6,912	0	4,645	--	1	--	[3]3,365	767	85
Wyoming	35,980	32,596	26,524	0	112	[2]3,016	478	27	1,839	2,715	669
Arizona	81,198	71,032	61,813	0	6,647	332	22	73	2,145	7,509	2,657
Colorado	56,404	49,432	38,942	5,005	201	837	2,574	593	1,280	4,346	2,626
Nevada	76	76	2	0	0	0	--	--	74	(4/)	(4/)
New Mexico	49,320	42,849	41,505	0	--	0	230	--	1,108	5,127	1,349
Utah	15,484	13,146	11,644	0	0	--	495	706	[3]341	1,484	852
Total	863,300	759,353	630,403	72,125	22,289	10,848	6,882	2,242	14,784	94,839	9,108

[1] Includes house logs, converter poles, shingle bolts, excelsior bolts, match stock, charcoal wood, and similar items.

[2] Includes a small amount of piling.

[3] Includes a small volume of commercial poles to avoid disclosure of individual operations.

[4] Less than 0.5 MCF.

Table 33. — *Removals from sawtimber in the Rocky Mountain States by roundwood products, logging residues, and other means, by State, 1966*

State	Total removals	Products								Logging residues	Other removals
		All products	Saw logs	Veneer logs	Pulpwood	Commercial poles	Mine timbers	Miscellaneous industrial wood[1]	Posts, fuelwood miscellaneous farm timbers		
	Thousand board feet, International 1/4-inch log rule										
Idaho	1,974,434	1,859,405	1,532,400	251,110	45,337	22,169	909	2,900	4,580	111,682	3,347
Montana	1,571,247	1,452,535	1,214,554	178,458	15,916	[2]15,663	19,034	1,407	7,503	116,679	2,033
W. South Dakota	94,772	92,094	43,794	0	28,242	--	6	--	[3]20,052	2,162	516
Wyoming	207,311	195,920	161,266	0	387	[2]22,911	3,059	164	8,133	7,374	4,017
Arizona	483,775	443,436	391,647	0	42,115	2,104	141	418	7,011	23,755	16,584
Colorado	339,114	310,425	244,244	32,930	1,274	5,250	16,474	3,776	6,477	12,204	16,485
Nevada	34	33	11	0	0	0	--	--	22	1	(4)
New Mexico	289,866	265,592	257,663	0	--	0	1,510	--	6,419	15,908	8,366
Utah	84,632	75,319	70,796	0	0	--	2,912	1,417	[3]194	4,433	4,880
Total	5,045,185	4,694,759	3,916,375	462,498	133,271	68,097	44,045	10,082	60,391	294,198	56,228

[1] Includes house logs, converter poles, shingle bolts, excelsior bolts, match stock, charcoal wood, and similar items.

[2] Includes a small amount of piling.

[3] Includes a small volume of commercial poles to avoid disclosure of individual operations.

[4] Less than 0.5 MBF.

Table 34. — *Log imports to sawmills and plywood plants[1] in the Rocky Mountain States, by State, 1966*

Receiving State	State of origin	Volume
		- -Thousand board feet[2]- -
Idaho	Montana	40,035
	Washington	29,208
	Wyoming	123
Montana	Idaho	109,336
	Wyoming	67
W. South Dakota	Wyoming	9,968
Wyoming	Idaho	2,980
	Montana	1,469
	W. South Dakota	10,248
	Utah	1,512
Arizona[3]	0	0
Colorado	New Mexico	14,442
	Wyoming	8,024
Nevada	California	44,434
New Mexico	Arizona	4,554
Utah	Nevada	11
Washington	Idaho	2,800

[1] Idaho and Montana are the only states reported as importing veneer logs.

[2] International 1/4-inch log rule.

[3] No log imports were reported in Arizona.

Table 35. — *Mill receipts of saw logs from Idaho timberlands by species and county of origin, 1966*

County	Species											All species	
	True firs[1]	Western larch	Engelmann spruce	Lodgepole pine	Western white pine[2]	Ponderosa pine	Douglas-fir	Western redcedar	Western hemlock[3]	Aspen	Cottonwood	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[3]												
Adams	10,289	781	3,748	869	--	43,315	22,634	--	--	--	--	81,636	4.9
Bear Lake, Franklin, Oneida	115	--	230	40	--	--	389	--	--	144	28	946	.1
Benewah	14,030	6,979	785	328	5,628	1,062	9,421	1,622	319	--	--	40,174	2.4
Blaine	94	--	63	56	--	--	4,569	--	--	--	29	4,811	.3
Boise	3,203	--	134	127	--	85,428	22,865	--	--	--	--	111,757	6.7
Bonner	17,239	12,587	5,598	394	22,211	3,009	18,368	4,679	8,312	--	29	92,426	5.5
Boundary	8,771	7,499	12,394	198	9,835	713	6,890	9,169	3,333	--	--	58,802	3.5
Camas	81	--	41	41	--	--	4,462	--	--	--	--	4,625	.3
Caribou	104	--	--	196	--	--	1,621	--	--	--	--	1,921	.1
Cassia, Power, Twin Falls	251	--	96	130	--	--	9,311	--	--	--	--	9,788	.6
Clearwater	109,871	33,906	12,328	211	177,402	25,520	77,601	52,832	4,461	--	--	494,132	29.7
Custer	3	--	151	55	--	--	5,144	--	--	--	--	5,353	.3
Elmore	113	--	31	26	--	17,105	6,894	--	--	--	--	24,169	1.5
Fremont	--	--	--	18,258	--	45	3,383	--	--	--	23	21,709	1.3
Gem	450	--	16	8	--	369	156	--	--	--	--	999	.1
Idaho	54,024	18,848	21,058	3,762	6,690	39,260	52,075	9,857	--	--	--	205,574	12.3
Kootenai	29,249	16,296	861	172	15,724	7,821	19,279	2,270	6,898	--	--	98,570	5.9
Latah	9,908	2,751	26	24	4,383	2,961	7,213	2,248	11	--	--	29,525	1.8
Lemhi	--	--	1,467	--	--	15,133	20,112	--	--	--	--	36,712	2.2
Lewis	841	--	--	--	--	3,883	1,188	--	--	--	--	5,912	.3
Madison	--	--	--	6,123	--	--	--	--	--	--	--	6,123	.4
Nez Perce	460	--	--	--	--	146	579	--	--	--	--	1,185	.1
Shoshone	60,187	25,850	8,669	1,817	58,094	3,614	39,319	12,272	11,617	--	--	221,839	13.3
Teton	--	--	--	3,067	11	--	33	--	--	--	--	3,111	.2
Valley	14,257	668	13,563	1,473	--	30,273	25,336	--	--	--	--	85,570	5.1
Washington	2,101	134	257	63	--	7,884	7,612	--	--	--	--	18,056	1.1
Total	335,641	126,299	81,516	37,443	299,978	287,741	366,454	94,949	35,151	144	109	1,665,425	100.0
Percent of total	20.2	7.6	4.9	2.2	18.0	17.3	22.0	5.7	2.1	(4/)	(4/)	100.0	

1/ Includes grand, white, and subalpine firs.

2/ Includes limber and whitebark pines.

3/ Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

Table 36. — *Mill receipts of veneer logs from Idaho timberlands by species and county of origin, 1966*

County	Species								All species	
	True firs[1]	Western larch	Engelmann spruce	Western white pine	Ponderosa pine	Douglas-fir	Western redcedar	Cottonwood[2]	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[3]									
Adams	1,069	61	400	--	176	2,031	--	--	3,737	1.4
Benewah	2,960	1,072	--	409	626	2,345	28	12	7,452	2.9
Boise, Gem	498	--	--	--	327	2,793	--	--	3,618	1.4
Bonner	--	14	--	19	192	8	44	694	971	.4
Boundary	--	--	--	4	40	2	--	109	155	(4/)
Clearwater	36,917	7,077	797	84,160	--	5,827	5	--	134,783	52.2
Elmore	--	--	--	--	20	169	--	--	189	.1
Idaho	106	25,000	12,980	--	--	25,084	--	--	63,170	24.5
Kootenai	2,787	2,803	269	2,632	2,812	395	607	1	12,306	4.8
Latah	1,949	981	--	--	11	1,918	--	--	4,859	1.9
Shoshone	6,695	5,447	280	551	295	4,951	1,053	336	19,608	7.6
Valley	1,888	87	1,790	--	131	3,385	--	--	7,281	2.8
Total	54,869	42,542	16,516	87,775	4,630	48,908	1,737	1,152	258,129	100.0
Percent of total	21.3	16.5	6.4	34.0	1.8	18.9	.7	.4	100.0	

[1] Includes grand, white, and subalpine firs.

[2] Includes a small amount of birch.

[3] Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

[4] Less than 0.05 percent.

Table 37. — *Mill receipts of round pulpwood from Idaho timberlands by species and county of origin, 1966*

County	Species									All species	
	True firs[1]	Western larch	Engelmann spruce	Lodgepole pine	Western white pine	Ponderosa pine	Douglas-fir	Western hemlock	Cottonwood	Cords	Percent
	Standard cords										
Benewah	3,364	--	4	366	--	--	--	1,749	328	5,811	5.4
Blaine	--	--	--	--	--	--	--	--	--	--	--
Bonner	589	--	6,422	8,424	--	--	--	20,275	525	36,235	34.0
Boundary	71	--	771	21	--	--	--	2,146	14	3,023	2.8
Clark	--	--	--	--	--	--	--	--	--	--	--
Clearwater	8,944	2,327	1,132	--	21,387	4,295	6,977	--	--	45,062	42.3
Custer	--	--	--	--	--	--	--	--	--	--	--
Fremont	--	--	--	--	--	--	--	--	--	--	--
Idaho	--	--	--	--	--	--	--	--	--	--	--
Kootenai	176	--	1,380	7,217	--	--	--	5,045	696	14,514	13.6
Latah	--	--	--	--	--	--	--	--	--	--	--
Lewis	--	--	--	--	--	--	--	--	--	--	--
Nez Perce	--	--	--	--	--	--	--	--	--	--	--
Shoshone	618	--	--	1,028	--	--	--	361	--	2,007	1.9
Teton	--	--	--	--	--	--	--	--	--	--	--
Twin Falls	--	--	--	--	--	--	--	--	--	--	--
Valley	--	--	--	--	--	--	--	--	--	--	--
Total	13,762	2,327	9,709	17,056	21,387	4,295	6,977	29,576	1,563	106,652	100.0
Percent of total	12.9	2.2	9.1	16.0	20.1	4.0	6.5	27.7	1.5	100.0	

[1] Includes grand, white, and subalpine firs.

Table 38. — *Output of roundwood products from Idaho timberlands by species and product, 1966*

Product	Species									All species	
	True firs[1]	Western larch	Engelmann spruce	Lodgepole pine	Western white pine[2]	Ponderosa pine	Douglas-fir	Western redcedar	Other species[3]	Volume	Percent
	Thousand cubic feet										
Saw logs	52,360	19,703	12,716	5,841	46,797	44,887	97,167	14,812	5,523	259,806	82.2
Veneer logs	8,340	6,466	2,510	0	14,342	704	7,434	264	176	39,236	12.4
Pulpwood	1,184	200	435	1,467	1,839	369	600	0	2,078	9,172	2.9
Commercial poles	0	74	0	464	0	0	0	3,013	0	3,571	1.1
Mine timbers	--	29	--	38	--	(4/)	75	--	--	142	.1
Miscellaneous industrial wood[5]	0	1	0	23	0	0	0	727	0	751	.2
Posts, fuelwood, miscellaneous farm timbers	13	137	--	2,111	--	52	678	438	81	3,510	1.1
Total	61,897	26,610	15,661	9,944	61,978	46,012	65,954	19,254	8,458	316,188	100.0
Percent of total	19.6	8.4	5.1	3.1	19.6	14.5	20.9	6.1	2.7	100.0	

[1] Includes white, grand, and subalpine firs.

[2] Includes a small amount of limber and whitebark pines.

[3] Includes western hemlock, juniper, aspen, and cottonwood.

[4] Less than 0.5 MCF.

[5] Includes house logs, shingle logs, picket stock, rails, cellar poles, and similar items.

Table 39. — *Output of roundwood products from Idaho timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes				
		National Forest	Other public	Forest industry[1]	Other private	All ownerships
	MCF	Percent				
Saw logs	52,8[illegible]	48.7	11.3	14.5	5.7	80.2
Veneer logs	3[illegible],23[illegible]	4.1	.8	5.6	1.9	12.4
Pulpwood	9,472	.7	.2	1.5	.5	2.9
Commercial poles	3,571	.3	.1	.5	.2	1.1
Mine timbers	14[illegible]	.1	(2/)	(2/)	(2/)	.1
Miscellaneous industrial wood[3]	791	.1	(2/)	.1	(2/)	.2
Posts, fuelwood, miscellaneous farm timbers	3,510	.8	.1	.1	.1	1.1
Total	316,188	54.8	11.5	23.3	11.4	100.0

1/ Lands owned by companies or individuals operating wood-using plants.

2/ Less than 0.05 percent.

3/ Includes house logs, shingle bolts, picket stock, rails, cellar poles, and similar items.

MONTANA

Table 40. — *Mill receipts of saw logs from Montana timberlands by species and county of origin, 1966*

County	Species										All species	
	True firs[1]	Western larch	Engelmann spruce	Lodgepole pine	Western white pine[2]	Ponderosa pine	Douglas-fir	Western redcedar	Western hemlock	Cottonwood	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[3]											
Beaverhead	629	--	3,659	23,815	--	371	8,755				37,229	3.0
Big Horn, Powder River, Rosebud	--	--	--	--	--	841	--				841	.1
Broadwater	--	--	--	1,824	--	--	2,614				4,438	.4
Carbon	--	--	--	--	--	--	580				580	(4/)
Choteau, Judith Basin	--	--	58	--	--	--	539				597	(4/)
Deer Lodge	--	--	--	3,479	--	--	--				3,479	.3
Fergus	--	--	--	1,722	--	365	4,922				7,009	.6
Flathead	3,155	30,052	46,849	10,155	4,967	13,653	57,057	139	214	266	166,507	13.3
Gallatin	33	--	2,205	26,666	--	--	21,541				50,445	4.0
Glacier	355	--	3,820	1,498	--	--	72				5,745	.5
Granite	664	488	1,043	11,245	579	585	13,315				27,919	2.2
Jefferson, Madison	--	--	--	1	--	--	323				324	(4/)
Lake	4,760	14,672	17,772	1,968	2,721	21,547	29,868	155			93,463	7.5
Lewis & Clark	51	--	679	1,787	--	2,349	15,312				23,178	1.8
Lincoln	14,938	93,338	33,303	23,165	16,397	48,727	65,278	8,496	3,903	59	307,604	24.5
Meagher	--	--	--	7,654	--	--	19,435				27,089	2.2
Mineral	1,464	9,565	4,861	2,055	3,145	20,832	11,462	62	186		53,632	4.3
Missoula	1,434	31,757	11,800	9,113	52	36,293	58,700				149,149	11.9
Musselshell	--	--	--	--	--	525	--				525	(4/)
Park	--	--	615	14,957	--	--	8,744				24,316	1.9
Powell	2,088	2,007	--	3,649	232	5,631	21,542				35,149	2.8
Ravalli	1,160	--	3,330	1,400	--	29,223	45,304				80,417	6.4
Sanders	5,264	27,986	10,447	8,815	7,026	48,672	43,333	473	1,366		153,382	12.2
Sweet Grass	--	--	--	--	--	189	662				851	.1
Total	35,995	209,865	140,441	154,968	35,119	229,803	432,358	9,325	5,869	325	1,253,868	100.0
Percent of total	2.9	16.7	11.2	12.4	2.8	18.3	34.5	.7	.5	(4/)	100.0	

[1/] Includes grand, white, and subalpine firs.

[2/] Includes limber and whitebark pines.

[3/] Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

[4/] Less than 0.05 percent.

Table 41. — *Mill receipts of veneer logs from Montana timberlands by species and county of origin, 1966*

County	Species									All species	
	True firs[1]	Western larch	Engelmann spruce	Lodgepole pine	Western white pine	Ponderosa pine	Douglas-fir	Western redcedar[2]	Cottonwood	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[3]										
Flathead	979	16,850	13,604	941	902	10	28,969	--	119	62,374	34.0
Lake	11	3,266	2,035	29	--	--	6,255	--	85	11,681	6.4
Lincoln	147	23,867	1,653	68	--	65	9,244	1	113	35,158	19.2
Mineral	--	2,000	--	--	--	--	1,750	--	--	3,750	2.0
Missoula	20	23,379	8,344	12	--	--	21,952	32	454	54,193	29.5
Sanders	122	5,652	1,843	49	2	119	7,823	309	374	16,293	8.9
Total	1,279	75,014	27,479	1,099	904	194	75,993	342	1,145	183,449	100.0
Percent of total	.7	40.9	15.0	.6	.5	.1	41.4	.2	.6	100.0	

[1] Includes grand, white, and subalpine firs.

[2] Includes a small amount of western hemlock.

[3] Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

Table 42. — *Mill receipts of round pulpwood from Montana timberlands by species and county of origin, 1966*

County	Species				All species	
	True firs[1]	Engelmann spruce	Lodgepole pine	Western hemlock	Cords	Percent
	Standard cords					
Gallatin	428	1,149	35,715	--	37,292	85.4
Lincoln	--	--	3,033	3,320	6,353	14.6
Total	428	1,149	38,748	3,320	43,645	100.0
Percent of total	1.0	2.6	88.8	7.6	100.0	

[1] Includes grand, white, and subalpine firs.

Table 43. — *Output of roundwood products from Montana timberlands by species and product, 1966*

Product	Softwoods									All species	
	True firs[1]	Western larch	Engelmann spruce	Lodgepole pine	Western white pine[2]	Ponderosa pine	Douglas-fir	Western redcedar	Other species[3]	Volume	Percent
	Thousand cubic feet										
Saw logs	5,615	32,739	21,909	24,175	5,478	35,849	67,445	1,455	935	195,603	82.1
Veneer logs	195	12,493	4,277	167	167	29	12,991	5	174	27,884	11.7
Pulpwood	37	--	99	3,330	--	--	--	0	285	3,753	1.6
Commercial poles[4]	0		0	2,470	0	73		353	0	2,472	1.0
Mine timbers	18	1,463	--	9	--	4	1,480	--	--	2,974	1.3
Miscellaneous industrial wood[5]	0	0	0	42	167	27	0	0	0	256	.1
Posts, fuelwood, miscellaneous farm timbers	--	238	14	2,616	--	159	252	60	1,960	5,289	2.2
Total	5,865	45,832	26,149	32,387	5,802	36,141	80,731	1,920	3,354	238,231	100.0
Percent of total	2.5	19.2	11.0	13.6	2.4	15.2	33.9	.8	1.4	100.0	

[1] Includes grand, white, and subalpine firs.

[2] Includes a small amount of limber and whitebark pines.

[3] Includes western hemlock, juniper, pinyon pine, and cottonwood.

[4] Includes a small volume of piling.

[5] Includes house logs, converter poles, and similar items.

Table 44. — *Output of roundwood products from Montana timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes				
		National Forest	Other public	Forest industry[1]	Other private	All ownerships
	- MCF -	- - - - - - - - - - - - Percent - - - - - - - - - - - -				
Saw logs	195,603	48.4	9.0	13.6	11.1	82.1
Veneer logs	27,884	7.9	.2	1.4	2.2	11.7
Pulpwood	3,753	1.6	--	--	(2/)	1.6
Commercial poles[3]	2,472	.7	(2/)	.1	.2	1.0
Mine timbers	3,974	(2/)	--	1.3	(2/)	1.3
Miscellaneous industrial wood[4]	256	(2/)	--	(2/)	.1	.1
Posts, fuelwood, miscellaneous farm timbers	5,289	.8	(2/)	.1	1.3	2.2
Total	238,231	59.4	9.2	16.5	14.9	100.0

[1] Lands owned by companies or individuals operating wood-using plants.

[2] Less than 0.05 percent.

[3] Includes a small amount of piling.

[4] Includes house logs, converter poles, and similar items.

Table 45. — *Mill receipts of saw logs from western South Dakota timberlands by species and county of origin, 1966*

County	Species		All species	
	White spruce	Ponderosa pine	Volume	Percent
	- - - Thousand board feet[1/] - - -			
Custer	--	15,015	15,015	33.9
Lawrence	5	9,213	9,218	20.8
Meade	--	5,258	5,258	11.9
Pennington	--	14,817	14,817	33.4
Total	5	44,303	44,308	100.0

[1/] International 1/4-inch log rule. Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

Table 46. — *Output of roundwood products from western South Dakota timberlands by species and product, 1966*

Product	Species		All species	
	White spruce	Ponderosa pine	Volume	Percent
	- - - Thousand cubic feet - - -			
Saw logs	1	6,911	6,912	43.6
Pulpwood	411	4,234	4,645	29.3
Mine timbers	--	1	1	(1/)
Posts, fuelwood, miscellaneous farm timbers[2/]	--	4,301	4,301	27.1
Total	412	15,447	15,859	100.0
Percent of total	2.6	97.4	100.0	

[1/] Less than 0.05 percent.

Table 47. — *Output of roundwood products from western South Dakota timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes				
		National Forest	Other public	Forest industry[1]	Other private	All ownerships
	MCF	Percent				
Saw logs	6,912	36.5	3.3	3.6	0.2	43.6
Pulpwood	4,645	24.6	2.2	2.4	.1	29.3
Mine timbers	1	--	--	--	(2/)	(2/)
Posts, fuelwood, miscellaneous farm timbers[3]	4,301	22.3	1.1	.6	3.1	27.1
Total	15,859	83.4	6.6	6.6	3.4	100.0

1/ Lands owned by companies or individuals operating wood-using plants.

2/ Less than 0.05 percent.

3/ Includes volume of commercial poles.

WYOMING

Table 48. — *Mill receipts of saw logs from Wyoming timberlands by species and county of origin, 1966*

County	Species					All species	
	True firs[1]	Engelmann spruce[2]	Lodgepole pine	Ponderosa pine	Douglas-fir	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[3]						
Albany	35	624	12,011	1,464	--	14,134	8.1
Big Horn	--	1,357	4,377	--	--	5,734	3.3
Carbon	460	9,069	20,281	--	--	29,810	17.2
Converse, Weston	--	--	--	81	--	81	(4)
Crook	--	--	--	23,413	--	23,413	13.5
Fremont	697	2,159	23,406	--	917	27,179	15.7
Hot Springs	--	967	968	--	691	2,626	1.5
Johnson	--	--	5,533	--	399	5,932	3.4
Lincoln	2,582	7,771	9,703	--	3,719	23,775	13.7
Park	--	269	54	--	200	523	.3
Sheridan	--	--	9,885	--	--	9,885	5.7
Sublette	--	5,528	2,280	--	--	7,808	4.5
Teton	105	1,389	20,367	--	448	22,309	12.9
Washakie	--	6	138	69	69	282	.2
Total	3,879	29,139	109,003	25,027	6,443	173,491	100.0
Percent of total	2.3	16.8	62.8	14.4	3.7	100.0	

[1] Includes white and subalpine firs.

[2] Includes white spruce.

[3] Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

[4]

Product	Species						All species	
	True firs[1]	Engelmann spruce[2]	Lodgepole pine	Ponderosa pine	Douglas-fir	Other species[3]	Volume	Percent
	Thousand cubic feet							
Saw logs	605	4,546	17,005	3,904	1,005	--	27,065	80.7
Pulpwood	--	--	141	--	--	--	141	.4
Commercial poles[4]	0	0	622	2,994	0	0	3,616	10.8
Mine timbers	(5)	419	57	2	--	(5)	478	1.4
Miscellaneous industrial wood[6]	--	--	28	--	--	--	28	.1
Posts, fuelwood, miscellaneous farm timbers	--	--	1,889	95	71	140	2,195	6.6
Total	605	4,965	19,742	6,995	1,076	140	33,523	100.0
Percent of total	1.8	14.8	58.9	20.9	3.2	.4	100.0	

[1] Includes white and subalpine firs.
[2] Includes white spruce.
[3] Includes juniper and aspen.
[4] Includes a small volume of piling.
[5] Less than 0.5 MCF.
[6] Includes house logsand similar items.

Table 50. — *Output of roundwood products from Wyoming timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes			
		National Forest	Other public	Private[1]	All ownerships
	MCF	Percent			
Saw logs	27,065	77.7	1.8	1.2	80.7
Pulpwood	141	.4	--	--	.4
Commercial poles[2]	3,616	9.7	1.6	.6	10.8
Mine timbers	478	1.4	--	--	1.4
Miscellaneous industrial wood[3]	28	.1	0	0	.1
Posts, fuelwood, miscellaneous farm timbers	2,195	[illegible]	.1	[illegible]	6.6
Total	33,523	92.6	3.4	4.1	100.0

[1] No receipts were reported from forest industry lands; i.e., lands owned by companies or individuals operating wood-using plants.
[2] Includes a small volume of piling.
[3] Includes house logs and similar items.

ARIZONA

Table 51. — *Output of roundwood products from Arizona timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes				
		National Forest	Other public	Forest industry[1]	Other private	All ownerships
	- MCF -	- - - - - - - - - - Percent - - - - - - - - - -				
Saw logs	62,437	51.1	17.6	.8	--	69.5
Pulpwood	6,647	6.7	.6	0	.1	7.4
Commercial poles	335	.3	0	.1	0	.4
Mine timbers	22	(2/)	--	--	--	(2/)
Miscellaneous industrial wood[3]	86	.1	0	0	(2/)	.1
Posts, fuelwood, miscellaneous farm timbers	20,346	16.6	5.7	.3	--	22.6
Total	89,873	74.8	23.9	1.2	.1	100.0

1/ Lands owned by companies or individuals operating wood-using plants.

2/ Less than 0.05 percent.

3/ Includes house logs, converter poles, excelsior bolts, and similar items.

Table 52. — *Output of roundwood products from Arizona timberlands by species and product, 1966*

Product	Species					All species	
	True firs[1]	Engelmann spruce	Ponderosa pine	Douglas-fir	Other species[2]	Volume	Percent
	Thousand cubic feet						
Saw logs	3,816	693	51,380	6,442	106	62,437	69.5
Pulpwood	--	--	6,647	--	--	6,647	7.4
Commercial poles	0	0	335	0	0	335	.4
Mine timbers	--	--	(3/)	--	22	22	(4/)
Miscellaneous industrial wood[5]	0	0	8	0	78	86	.1
Posts, fuelwood, miscellaneous farm timbers	--	--	4,002	--	16,344	20,346	22.6
Total	3,816	693	62,372	6,442	16,550	89,873	100.0
Percent of total	4.2	.8	69.4	7.2	18.4	100.0	

1/ Includes white, subalpine, and corkbark firs.

2/ Includes juniper, pinyon pine, and aspen.

3/ Less than 0.5 MCF.

4/ Less than 0.05 percent.

5/ Includes house logs, converter poles, excelsior bolts, and similar items.

Table 53. — *Mill receipts of saw logs from Arizona timberlands by species and county of origin, 1966*

County	Species						All species	
	True firs[1]	Engelmann spruce	White pine[2]	Ponderosa pine	Douglas-fir	Aspen	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[3]							
Apache	11,490	1,638	--	100,496	27,007	--	140,541	35.1
Coconino	10,278	2,718	--	142,692	9,714	--	165,402	41.3
Gila	2,271	--	--	23,265	3,032	--	28,568	7.2
Graham, Greenlee	--	--	--	12,393	--	--	12,393	3.1
Mohave, Pima, Yavapai	4	--	6	1,963	28	--	2,001	.5
Navajo	417	84	3	48,640	1,515	672	51,331	12.8
Total	24,460	4,440	9	329,359	41,296	672	400,236	100.0
Percent of total	6.1	1.1	(4)	82.3	10.3	.2	100.0	

[1] Includes white, subalpine, and corkbark firs.

[2] Mexican white pine (Pinus flexilis var. reflexa Engelmann).

[3] Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

[4] Less than 0.05 percent.

Table 54. — *Mill receipts of saw logs from Colorado timberlands by species and county of origin, 1966*

County	Species							All Species	
	True firs[1]	Engelmann spruce[2]	Lodgepole pine	Ponderosa pine[3]	Douglas-fir	Aspen	Cottonwood	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[4]								
Archuleta	860	1,327	--	6,034	209	247	--	8,677	3.4
Chaffee	--	155	51	103	129	--	--	438	.2
Conejos	935	5,263	--	325	1,928	--	--	8,451	3.4
Custer, Huerfano	357	7,661	--	1,850	260	--	--	10,128	4.0
Delta	3	2,782	--	--	--	174	--	2,959	1.2
Dolores	--	260	--	3,857	--	--	--	4,117	1.6
Douglas	--	--	--	3,367	1,419	--	--	4,786	1.9
Eagle	467	4,375	1,500	--	--	--	--	6,342	2.5
El Paso, Pueblo, Teller	32	5	--	1,188	65	--	893	2,183	.9
Garfield	32	766	--	--	--	--	--	798	.3
Grand	--	6,625	5,354	--	--	--	--	11,979	4.7
Gunnison	548	12,703	83	--	188	2,191	--	15,713	6.2
Hinsdale	3,032	15,928	--	4,921	1,230	6	--	25,117	10.0
Jackson	38	5,893	11,771	--	--	--	--	17,702	7.0
Jefferson	--	--	--	779	260	--	--	1,039	.4
Lake	--	110	38	--	--	--	--	148	.1
La Plata	1,455	16,763	--	854	240	32	2	19,366	7.7
Larimer	--	10,778	7,573	337	44	--	--	18,732	7.4
Las Animas	--	--	--	713	26	51	21	811	.3
Mesa	--	141	--	1,544	--	--	--	1,685	.7
Mineral	5,806	18,529	--	4,918	905	--	--	30,158	12.0
Moffat, Routt	1,243	18,592	6,389	--	--	--	--	26,224	10.4
Montezuma	--	2,450	--	130	--	2,008	--	4,588	1.8
Montrose	114	4,403	--	4,660	349	--	--	9,526	3.8
Ouray	34	2,563	--	38	3	28	--	2,666	1.0
Park	--	3,522	1,819	186	--	--	--	5,526	2.2
Pitkin	390	2,089	--	--	--	--	--	2,479	1.0
Rio Grande	41	2,163	--	--	--	--	--	2,204	.9
Saguache	612	6,277	36	116	168	--	--	7,209	2.9
San Miguel	--	--	--	--	--	392	--	392	.1
Total	15,999	158,143	34,615	56,923	7,402	5,129	916	252,145	100.0
Percent of total	6.4	60.3	13.7	14.3	2.9	2.1	.4	100.0	

[1] Includes white, subalpine, and corkbark firs.

[2] Includes blue spruce.

[3] Includes limber pine.

[4] Scribner log rule volumes can be approximated by multiplying table volumes by 0.84.

Table 55. — *Mill receipts of veneer[1] logs from Colorado timberlands by species and county of origin, 1966*

County	Species				All species	
	True firs[2]	Engelmann spruce[3]	Ponderosa pine	Aspen	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[4]					
Dolores	1,500	6,276	13,549	0	21,325	64.8
Montezuma	1,911	8,525	1,077	92	11,605	35.2
Total	3,411	14,801	14,626	92	32,930	100.0
Percent of total	10.4	44.9	44.4	.3	100.0	

[1] Veneer logs used in Colorado are of average saw-log quality.

[2] Includes white, subalpine, and corkbark firs.

[3] Includes blue spruce.

[4] Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

Table 56. — *Output of roundwood products from Colorado timberlands by species and product, 1966*

Product	Species							All species	
	True firs[1]	Engelmann spruce[2]	Lodgepole pine	Limber pine	Ponderosa pine	Douglas-fir	Other species[3]	Volume	Percent
	Thousand cubic feet								
Saw logs	2,496	23,734	5,400	5	5,599	1,158	943	39,335	77.3
Veneer logs	518	2,250	0	0	2,223	0	14	5,005	9.8
Pulpwood	--	27	174	--	--	--	--	201	.4
Commercial poles	0	0	837	0	0	0	0	837	1.6
Mine timbers	1	388	968	0	1,210	4	3	2,574	5.1
Miscellaneous industrial wood[4]	0	26	3	0	0	0	564	593	1.2
Posts, fuelwood, miscellaneous farm timbers	--	56	1,338	8	306	60	566	2,334	4.6
Total	3,015	26,481	8,720	13	9,338	1,222	2,090	50,879	100.0
Percent of total	5.9	52.1	17.1	(5)	18.4	2.4	4.1	100.0	

[1] Includes white, subalpine, and corkbark firs.

[2] Includes blue spruce.

[3] Includes juniper, pinyon pine, aspen, and cottonwood.

[4] Includes house logs, excelsior bolts, match stock, and similar items.

[5] Less than 0.05 percent.

Table 57. — *Output of roundwood products from Colorado timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes				
		National Forest	Other public	Forest industry[1]	Other private	All ownerships
	MCF	Percent				
Saw logs	39,335	70.5	4.4	0.4	2.0	77.3
Veneer logs	5,005	9.8	0	0	0	9.8
Pulpwood	201	.2	.1	0	.1	.4
Commercial poles	837	1.5	0	0	.1	1.6
Mine timbers	2,574	3.8	.1	.1	1.1	5.1
Miscellaneous industrial wood[2]	593	1.0	0	0	.2	1.2
Posts, fuelwood, miscellaneous farm timbers	2,334	4.0	.2	(3)	.4	4.6
Total	50,879	90.8	4.8	.5	3.9	100.0

[1] Lands owned by companies or individuals operating wood-using plants.

[2] Includes house logs, excelsior bolts, match stock, and similar items.

[3] Less than 0.05 percent.

Table 58. — *Output of roundwood products from Nevada timberlands by species and product, 1966*

Product	Species			All species	
	White fir	Ponderosa pine	Other species[1]	Volume	Percent
	Thousand cubic feet				
Saw logs	0	2	0	2	0.9
Posts, fuelwood, miscellaneous farm timbers	23	22	176	221	99.1
Total	23	24	176	223	100.0
Percent of total	10.3	10.8	78.9	100.0	

[1] Includes juniper, pinyon pine, and aspen.

Table 59. — *Output of roundwood products from Nevada timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes			
		National Forest	Other public	Other private[1]	All ownerships
	MCF	Percent			
Saw logs	2	0.9	0	0	0.9
Posts, fuelwood, miscellaneous farm timbers	221	18.4	34.5	46.2	99.1
Total	223	19.3	34.5	46.2	100.0

[1] No receipts were reported from forest industry lands; i.e., lands owned by companies or individuals operating wood-using plants.

NEW MEXICO

Table 60. — *Mill receipts of saw logs from New Mexico timberlands by species and county of origin, 1966*

County	Species							All species	
	True firs[1]	Engelmann spruce[2]	Pinyon pine	Limber pine	Ponderosa pine	Douglas-fir	Aspen[3]	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[4]								
Bernalillo	515	2	--	--	115	144	--	776	0.3
Catron	872	--	114	--	25,199	2,566	--	28,751	10.6
Colfax	1,180	18,463	--	--	8,906	7,765	599	36,913	13.6
Grant	--	--	2	--	602	--	--	604	.2
Los Alamos, Rio Arriba	1,012	11,057	570	--	24,646	3,866	597	41,748	15.4
McKinley	--	61	--	--	37,292	3,874	--	41,227	15.2
Mora	29	285	--	--	221	540	--	1,075	.4
Otero	4,424	37	--	992	6,988	7,036	--	19,477	7.2
Sandoval	5,327	14,716	--	580	30,634	23,596	--	74,853	27.5
San Miguel	2,281	--	--	110	5,028	2,851	--	10,270	3.8
Sierra, Socorro, Torrance	--	--	--	102	2,550	426	--	3,078	1.1
Taos	10	1,625	--	--	1,356	1,356	3,256	7,603	2.8
Valencia	--	--	742	--	4,233	135	--	5,110	1.9
Total	15,650	46,246	1,428	1,784	147,770	54,155	4,452	271,485	100.0
Percent of total	5.8	17.0	.5	.7	54.4	20.0	1.6	100.0	

[1] Includes white, subalpine, and corkbark firs.

[2] Includes blue spruce.

[3] Includes a small volume of cottonwood.

[4] Scribner log rule volumes can be approximated by multiplying table volumes by 0.89.

Table 61. — *Output of roundwood products from New Mexico timberlands by species and product, 1966*

Product	Species						All species	
	True firs[1]	Engelmann spruce[2]	Limber pine	Ponderosa pine	Douglas-fir	Other species[3]	Volume	Percent
	Thousand cubic feet							
Saw logs	2,442	7,214	278	23,052	8,448	918	42,352	83.1
Mine timbers	--	--	--	81	--	155	236	.5
Posts, fuelwood, miscellaneous farm timbers	--	--	--	1,914	122	6,362	8,398	16.4
Total	2,442	7,214	278	25,047	8,570	7,435	50,986	100.0
Percent of total	4.8	14.2	.5	49.1	16.8	14.6	100.0	

[1] Includes white, subalpine, and corkbark firs.

[2] Includes blue spruce.

[3] Includes juniper, pinyon pine, aspen, and cottonwood.

Table 62. — *Output of roundwood products from New Mexico timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes				
		National Forest	Other public	Forest industry[1]	Other private	All ownerships
	MCF	Percent				
Saw logs	42,352	43.3	5.0	11.8	23.0	83.1
Mine timbers	236	.4	.1	--	(2)	.5
Posts, fuelwood, miscellaneous farm timbers	8,398	7.6	.8	2.1	5.9	16.4
Total	50,986	51.3	5.9	13.9	28.9	100.0

[1] Lands owned by companies or individuals operating wood-using plants.

[2] Less than 0.05 percent.

UTAH

Table 63. — *Mill receipts of saw logs from Utah timberlands by species and county of origin, 1966*

County	Species							All species	
	True firs[1]	Engelmann spruce	Lodgepole pine	Ponderosa pine	Douglas-fir	Aspen	Cottonwood[2]	Volume	Percent
	Thousand board feet, International 1/4-inch log rule[3]								
Beaver, Iron, Millard	14	231	--	--	--	--	4	249	0.3
Cache, Rich	--	68	22	--	79	--	1	170	.2
Carbon, Emery	--	--	--	56	227	141	--	424	.5
Daggett	--	--	184	303	302	--	--	789	1.0
Duchesne	--	2,083	2,729	3,963	--	--	86	8,861	11.4
Garfield	2,719	7,224	--	12,698	1,811	--	--	24,452	31.5
Kane	17	--	--	1,556	133	--	--	1,706	2.2
San Juan	--	--	--	24,990	--	--	--	24,990	32.1
Sanpete	5	281	--	--	--	462	5	753	1.0
Sevier	--	--	--	--	--	327	--	327	.4
Summit	251	1,159	2,118	--	310	--	22	3,860	5.0
Uintah	--	1,408	4,051	202	--	--	226	5,887	7.6
Utah	170	--	--	--	56	--	56	282	.4
Wasatch	--	2,203	346	--	22	169	791	3,531	4.5
Wayne	--	485	--	848	56	80	--	1,469	1.9
Total	3,176	15,142	9,450	44,616	2,996	1,179	1,191	77,750	100.0
Percent of total	4.1	19.5	12.2	57.4	3.8	1.5	1.5	100.0	

[1] Includes white and subalpine firs.

[2] Includes other hardwoods and a small amount of juniper.

[3] Scribner log rule volumes can be approximated by multiplying table values by 0.89.

Table 64. — *Output of roundwood products from Utah timberlands by species and product, 1966*

Products	Species						All species	
	True firs[1]	Engelmann spruce	Lodgepole pine	Ponderosa pine	Douglas-fir	Other species[2]	Volume	Percent
	Thousand cubic feet							
Saw logs	496	2,362	1,474	6,960	467	370	12,129	86.5
Mine timbers	2	40	394	5	12	2	455	3.2
Miscellaneous industrial wood[3]	26	210	342	0	0	157	735	5.2
Posts, fuelwood, miscellaneous farm timbers[4]	0	7	306	11	6	381	711	5.1
Total	524	2,619	2,516	6,976	485	910	14,030	100.0
Percent of total	3.7	18.7	17.9	49.7	3.5	6.5	100.0	

[1] Includes white and subalpine firs.

[2] Includes juniper, pinyon pine, aspen, cottonwood, and other hardwoods.

[3] Includes converter poles, excelsior bolts, and similar items.

[4] Includes volume of commercial poles to avoid disclosure of individual operations.

Table 65. — *Output of roundwood products from Utah timberlands by land ownership class and product, 1966*

Product	Total volume	Land ownership classes			
		National Forest	Other public	Other private[1]	All ownerships
	- MCF -	- - - - - - - - Percent - - - - - - - - -			
Saw logs	12,129	78.7	4.0	3.8	86.5
Mine timbers	455	3.1	(2)	.1	3.2
Miscellaneous industrial wood[3]	735	3.7	0	1.5	5.2
Posts, fuelwood, miscellaneous farm timbers[4]	711	4.4	.1	.6	5.1
Total	14,030	89.9	4.1	6.0	100.0

[1] No receipts were reported from forest industry lands; i.e., lands owned by companies or individuals operating wood-using plants.

[2] Less than 0.05 percent.

[3] Includes converter poles, excelsior bolts, and similar items.

[4] Includes volume of commercial poles to avoid disclosure of individual operations.

MAPS

Major Timber Industries in the
Rocky Mountain States

Saw Log Output by Counties, 1966,
Rocky Mountain States

ROCKY MOUNTAIN STATES

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION

FOREST SURVEY

U S DEPARTMENT OF AGRICULTURE • FOREST SERVICE

MONTANA

Helena

WESTERN SOUTH DAKOTA

103rd MERIDIAN

IDAHO

Boise

WYOMING

CONTINENTAL DIVIDE

Cheyenne

Salt Lake City

NEVADA

Carson City

UTAH

Denver

COLORADO

ARIZONA

Phoenix

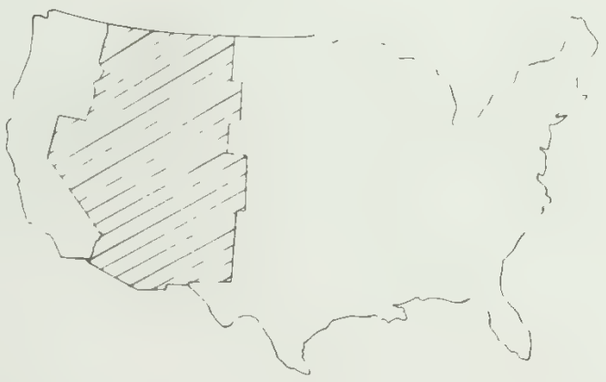
NEW MEXICO

Santa Fe

CONTINENTAL DIVIDE

- SAWMILL (as of 1966)[1]
- PULPMILL (as of 1968)
- PLYWOOD OR VENEER PLANT (as of 1968)

[1] In addition to the plotted sawmills, there were active sawmills that either did not furnish a report in the 1966 timber products survey, or whose report did not contain ade quate information for locating on the map



SETZER, THEODORE S., and ALVIN K. WILSON

1970. Timber products in the Rocky Mountain States, 1966. USDA Forest Serv. Resource Bull. INT-9, 89 p., illus.

Reports findings of the second comprehensive survey of output of timber products in the Rocky Mountain States. Presents statistics in production of saw logs, veneer logs, pulpwood, and various other roundwood products by States and land ownership classes. Also shows sawlog production by county and volumes of plant byproducts and plant residues. Makes comparisons with 1962 output and indicates trends since 1952. Estimates are given of total removals from growing stock and sawtimber in 1966.

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Headquarters for the Intermountain Forest and Range Experiment Station are in Ogden, Utah. Field Research Work Units are maintained in:

Boise, Idaho
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Logan, Utah (in cooperation with Utah State University)
Missoula, Montana (in cooperation with University of Montana)
Moscow, Idaho (in cooperation with the University of Idaho)
Provo, Utah (in cooperation with Brigham Young University)

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THE ROCKY MOUNTAIN TIMBER SITUATION, 1970

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THE ROCKY MOUNTAIN TIMBER SITUATION, 1970

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ABSTRACT

Presents highlights of the 1970 forest situation in the Rocky Mountain States. Describes the forest resource and the timber supply outlook; discusses some problems and opportunities for increasing timber output. Includes statistical tables: areas by land classes; ownership; growing stock volumes; net annual growth; mortality; roundwood products output; and logging residues.

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INTRODUCTION

When the Nation's timber supply was last assessed in 1962, the relationship of timber harvest to growth was a major concern. However, the data showed that fears of a timber famine probably were unfounded if the future demand for timber stayed within projected limits and if management activities in timber stands could be intensified.

The remainder of the decade saw some dramatic changes in the use and management of forest lands. The demand for timber products was slightly higher than projected and at the same time the demand for nontimber uses of forest land increased sharply. In addition, a growing public awareness and understanding of the role of the forest in man's environment began to develop. An active concern for the protection of that environment led to more stringent requirements for management of forest land. In many areas, restrictions have been placed on certain uses of forest land as well as on the kinds of activities allowed in timber production.

In addressing the current timber supply situation, some would continue to dramatize it as a "timber famine," while others would not. Thus, the basic question has not changed since the last timber supply assessment, but the basis for concern is vastly different. Where before the balance of cut and growth was the major issue, now the availability of forest land for timber production and having to operate within budgetary and environmental constraints have taken on primary importance.

This report is not a duplication of the 1970 National Timber Review.[1] Rather, it presents highlights of the forest situation in the Rocky Mountain Forest Survey Section (Idaho, Montana, western South Dakota, Wyoming, Arizona, Colorado, Nevada, New Mexico, and Utah). It describes the resource, the timber supply outlook, and some of the problems associated with increasing the timber output from this region.

---

[1] USDA Forest Service. The outlook for timber in the United States, Resour. Rep. 20, Oct. 1973.

THE TIMBER RESOURCE

Timber Base Area

In 1970, there were about 138 million acres of forest land in the Rocky Mountain States, of which 61.6 million were classed as commercial forest land (CFL) suitable and available for timber-growing activities:[2]

	Million acres
Total land area	554.8
Forest land	138.3
Commercial	[3]61.6
Productive reserved	7.9
Deferred	2.3
Unproductive	66.5

Commercial forest land is land...

The nature of the commercial timber base area is that it is considered to be both suitable and available for the production and harvest of industrial wood. It can be counted on as a reliable source of timber now and in the future.

that is both suitable and available for timber production activities.

"Suitability" pertains to factors of productivity and the capacity of the land to withstand the physical disturbance associated with timber management and harvesting activities. "Availability" has to do with the relative importance of timber in relation to other uses and the relative difficulty of management and harvest.

---

[2] Commercial forest land is defined for the 1970 Timber Review as forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. Areas qualifying as commercial forest land must have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Currently included are inacessible and inoperable areas.

[3] This figure (1970 National Timber Review) includes 5 million acres of commercial forest land on National Forests placed in "commercial unregulated" category, indicating it cannot be relied upon for timber products output because of probable conflict with other uses. It is not included in allowable cut calculations or in future timber supply projections.

Administrative decisions can make more or less forest land available for supplying wood. New logging techniques and higher wood prices could make more wood available--from timber that is today technologically or economically unavailable. Unfortunately, present timber inventories do not take into account all the important factors that affect economic or technological availability of forest land for timber use. Moreover, in the case of nonindustrial private owners, there is always the question of the owner's intent. Will he cut at current wood prices or at some higher price? In fact, will he cut at any price?

Historically commercial forest land area has fluctuated...

It is tempting to compare current figures for commercial forest area with those reported in previous timber supply assessments (table 1). Whatever magic may be assigned such figures for long-range planning purposes should be tempered by the realization that commercial forest land is somehow whatever it is said to be. Changes in definitions and measurement rules make fickle benchmarks of such figures for purposes of gaging progress or status of forestry activity.

depending on marketable species...

Historically, the outlook and attitude toward productive forest land in the Rocky Mountain States can be divided into three phases. The first, which began before the turn of the century, was characterized by interest in only the most valuable and high-quality species because of the long distances to principal markets. In that era only a small portion of the timber resource was considered commercial from the practical standpoint.

Table 1.--Trends and projection of commercial forest area in the Rocky Mountains by owner class

Owner class	1952	1962	*1970*	1980	2000	2020
			Million acres			
National Forest	38.4	38.8	*34.8*	34.8	34.8	34.8
Other public	7.2	7.2	*7.2*	4.3	4.3	4.3
Forest industry	2.3	2.2	*2.2*	2.2	2.2	2.2
Other private	12.5	12.5	*12.4*	6.2	6.2	6.2
Total	60.4	60.7	[1]*56.6*	47.5	47.5	47.5

[1]Future timber supplies were projected on the basis of 56.6 million acres of commercial forest land suitable and available for timber production activities.

demands for timber...

The second phase broke abruptly after World War II when backlog demands for housing and improvements in transportation combined to make previously economically derelict species quite usable. Record volumes were removed from a commercial timber base that, during and after the war years, began to increase in size merely through changes in attitude and definition. By 1962 some 60.7 million acres were registered in the books as commercial.

and use constraints.

Growing recognition of nontimber forest values triggered the beginning of the third phase, the one we are presently in. Although scenic and recreational qualities of the Rocky Mountains have been generally recognized since the 19th century, only recently has broader public attention been focused on nontimber uses and environmental impacts associated with timber growing and harvesting (fig. 1).

In short, the pendulum has started to swing back toward a more limited area being classed as commercial

Figure 1.--*Areas of land such as this are capable of producing more than 20 cubic feet of wood per acre per year. Will they be used for timber production?*

forest land in the Rocky Mountains. It has been most apparent on the National Forests, where even before significant withdrawals of productive forest land were made, reductions in allowable cut were accommodating the increasing demand for nontimber uses. Yet this was recognized as insufficient to meet public demands.

Currently recreation and environmental impacts are of vital concern to the public.

The growing demand for Wilderness led to the creation of an additional 1.5 million acres of Wilderness between 1962 and 1970 on public land in the eight Rocky Mountain States. Much of this is high country of little or no importance for timber production (fig. 2 and 3). However, there may be some impact on timber supplies associated with these withdrawals in relation to what would have been commercial timber immediately adjacent. Limitations on the kind and extent of timber extraction activities that can be undertaken affect the quantities of wood that can be made available on the adjacent areas.

Some 2.3 million acres of productive forest land are currently under study for possible inclusion into the Wilderness System or withdrawal in favor of some other restricted use. Beyond that, questions of economic and physical operability without undue damage to the resources and to other values, and diversion of forest land to a variety of other uses have had a significant impact on the area of forest land that can reasonably be included in the commercial timber base. There are sizable areas of National Forest land in several States classed as CFL "deferred." No decision has been reached regarding withdrawal of these lands in favor of nontimber use.

Colorado, Idaho, and Montana have the largest areas of National Forest in the "deferred" category. It is likely there will be further reductions in CFL area in Colorado and Idaho, as well as in other States because of land use changes and environmental protection considerations.

As of 1970, a total of about 5 million acres of CFL on National Forests in the Rocky Mountain States had been placed in an "unregulated" category, to preclude a commitment to exploitation of its timber resources in the face of increasing demands for nontimber use of that land, and potential environmental degradation. Half of this land is in Colorado. By 1972, a total of 184 areas containing 6.6 million acres were under study in the Rocky Mountain States for possible reclassification into some nontimber use.

Unfortunately, these shifts in land use and use emphasis are so recent the present statistics do not fully

Figure 2.--*Some areas set aside for recreation, esthetic enjoyment, and scientific study have little impact on timber supply.*

Figure 3.--*Some areas set aside for recreation, esthetic enjoyment, and scientific study have a significant impact on timber supply.*

Table 2.--Total forest land and commercial forest land in the Rocky Mountain States, 1970

State	Total forest land	Commercial forest land			
		CFL[1]	Percent	National Forest unregulated	National Forest deferred
	Thousand acres			*Thousand acres*	
North. Rocky Mt. States:					
Idaho	21,638.2	14,196.9	65.61	995.5	735.6
Montana	22,777.6	15,850.6	69.59	132.8	641.1
Western S. Dakota	1,399.4	1,253.8	89.60	56.6	--
Wyoming	10,085.1	3,255.8	32.28	926.5	121.9
Total	55,900.3	34,557.1	61.82	2,111.4	1,498.6
South. Rocky Mt. States:					
Arizona	18,583.7	3,636.8	19.57	53.1	10.3
Colorado	22,534.7	9,039.5	40.11	2,544.2	702.4
Nevada	7,660.6	127.6	1.67	1.0	--
New Mexico	18,313.7	5,605.2	30.61	131.2	48.6
Utah	15,288.1	3,618.8	23.67	205.8	22.0
Total	82,380.8	22,027.9	26.74	2,935.3	783.3
Total Rocky Mts.	138,281.1	56,585.0	40.92	5,046.7	2,281.9

[1]These commercial forest land areas do not include National Forest unregulated and deferred acreages. For the Rocky Mountain States, the area of commercial forest land plus the area of National Forest unregulated land totals 61.6 million acres.

reflect their impact on future timber supplies. While not all the 2.3 million acres presently under consideration for Wilderness or the 5 million acres in the unregulated category may actually be withdrawn, the possibility is there. Other public agencies, faced with the same changing use pressures as the Forest Service, are likely to reduce their commercial timber base areas also.

Shifting ownerships and the consequent rarity of long-range plans make it difficult to project the future availability of timber on private lands. However, it is apparent that a substantial and increasing number of owners hold these lands for purposes that exclude timber cutting. As much as 50 percent of the privately owned forest land now classed as commercial may be out of the timber base by 1980.

After 1980 the area suitable and available for timber production is expected to stabilize.

In total, the area of forest land that can be relied upon as a planning base for timber supply is less than the 66 million acres shown in Timber Trends in the United States[4] for 1962. After 1980 we expect the actual timber base area will stabilize at about 47.5 million acres.

[4] U.S. Forest Service. Timber trends in the United States. For. Serv. Resour. Rep. 17, 235 p., illus. Govt. Print. Off., Wash., D. C. 1965.

Who Owns What, Where

THE TYPICAL ACRE OF COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES IS A SAWTIMBER STAND OF PONDEROSA PINE ON A NATIONAL FOREST.

Location

The 61.6 million acres now officially classified as CFL (a little more than 12 percent of the total in the United States) are split about 60-40 between the northern and southern Rocky Mountain States. The Northern States not only have more acreage of CFL than the Southern States, but they also have a larger proportion of forest land in the commercial category (table 2). The proportion of forest area in CFL varies widely by State, from nearly all in western South Dakota to nearly none in Nevada.

More than half the Rocky Mountain total of commercial forest is in Idaho and Montana, whose 31.2 million acres (including "unregulated") represent 85 percent of the CFL in all four Northern States. Colorado, with more than 11 million acres, accounts for almost half the CFL in the southern region and has over twice as much as any other State in the region. Nevada has the least CFL of any State in the Rocky Mountain Section.

Ownership

Most of the CFL is federally owned or administered, and the Forest Service has the biggest share of it.

Little new can be said about the ownership of CFL in the Rocky Mountains. Nearly three-fourths of it is publicly owned or administered and most of that is under the administration of Federal agencies. The Forest Service has more of it than anyone else; its 35 million acres represent 61 percent of CFL in the Rocky Mountains and 83 percent of all publicly owned or administered CFL. More than half the Forest Service holdings are in Idaho and Montana.

The Bureau of Land Management and the Bureau of Indian Affairs are the other two Federal agencies managing CFL.[5] The BLM has most of its holdings in the Northern States while Indian lands are predominantly in the Southern. The combined holdings of these two agencies amount to slightly less than 5 million acres or 9 percent of the total.

[5] Although Indian lands are listed as being in Federal ownership due to the nature of their Federal trusteeship and administration, they are in reality privately owned by the various tribes.

Other public forest lands are largely State-owned, with the largest holdings in Montana and Idaho. There is more State-owned CFL in the Northern States than in the Southern.

Industrial holdings are minor.

Private holdings of CFL are largely farms; these are more common in the Southern States than in the Northern. Forest industry has only about 2.2 million acres of CFL, almost all of it in Idaho and Montana. In the Southern States, industrial holdings are insignificant.

Timber--Kinds and Sizes

Sawtimber stands dominate...

Sawtimber stands dominate the CFL in the Rocky Mountain States (fig. 3). Idaho and Montana have the largest areas of sawtimber stands, but Arizona, New Mexico, and Nevada have the highest proportions of sawtimber. There are some timber management problems inherent in such an imbalance of size classes; however, stand-size classification alone can be misleading in terms of diameter distribution, simply because of the way stand sizes are defined.[6] For example, in the ponderosa pine forests of Arizona and New Mexico, smaller diameter classes are common in stands that are classed as sawtimber on the basis of crown occupancy. In the Southwest, where selective cutting may not have a noticeable effect on stand-size classification for some years, establishment of regeneration is of more concern. Regeneration problems following cutting are common in other areas as well; in Colorado they are reflected in the comparatively high proportion (11 percent) of CFL considered to be nonstocked (fig. 4).

particularly in the Southwest.

Ponderosa pine and...

There are over 15 million acres of ponderosa pine, which makes it the most extensive type in the Rocky Mountains. It is dominant in the Southwest, the Black Hills of South Dakota, and the drier portions of Idaho and Montana.

Douglas-fir are major species used...

Douglas-fir occupies more than 12 million acres, mostly on the moister sites, and is widely distributed throughout the Rocky Mountain area. In terms of growing-stock volume, Douglas-fir overshadows ponderosa pine.

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[6] Softwood sawtimber trees need only be 9.0 inches d.b.h. (hardwoods, 11.0 inches); sawtimber stands need only have half the total stocking in sawtimber and poletimber trees, with sawtimber at least equal to poletimber stocking.

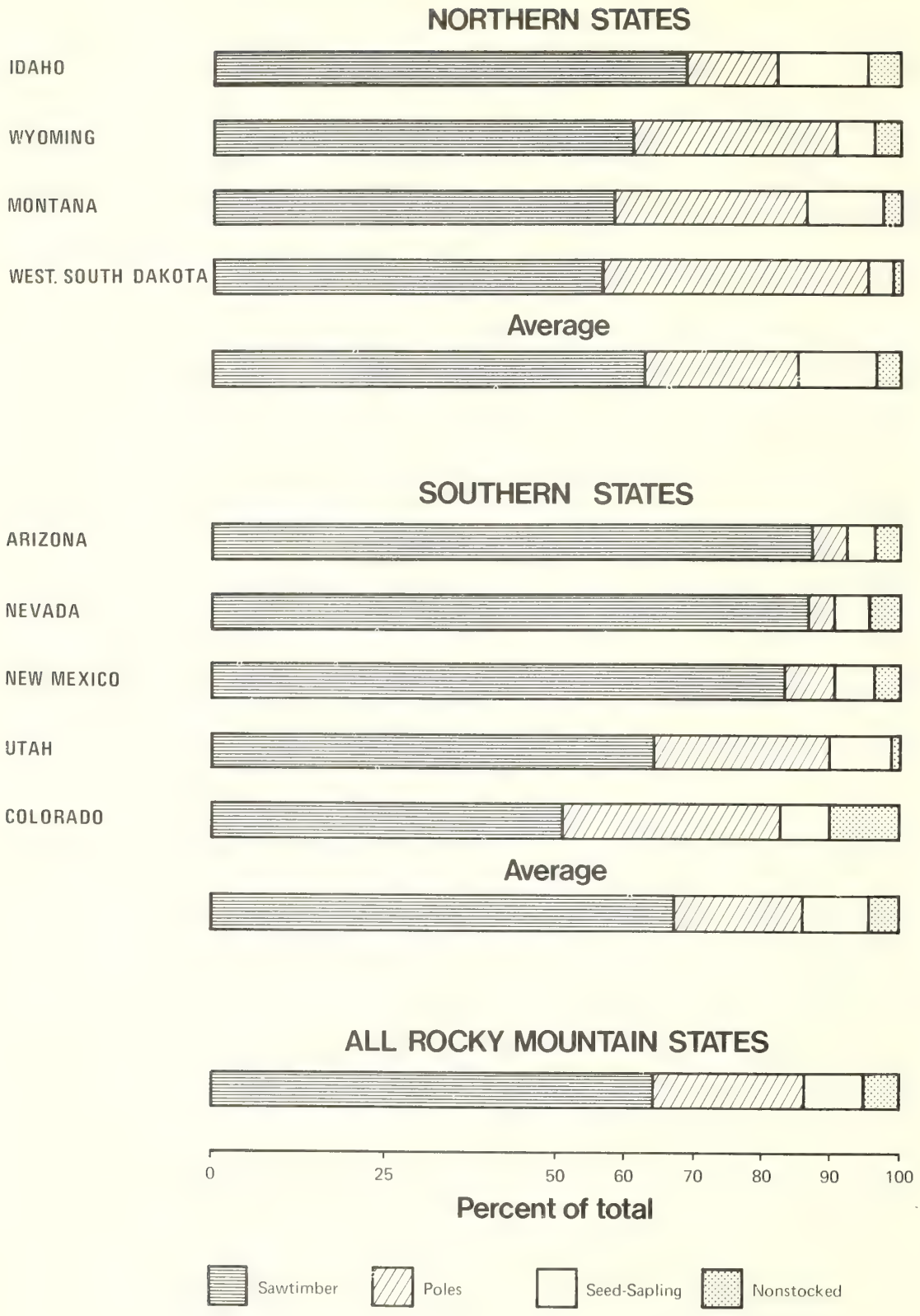


Figure 4.--*Percent of commercial forest land by stand-size class, 1970.*

but lodgepole pine occupies large areas.

Lodgepole pine occupies 10 million acres of CFL, much to the disappointment of many managers. In some areas it is a useful resource, in others it is regarded (rightly or wrongly) as a roadblock to progress. Small size and low vigor (the consequences of stagnation), as well as lack of markets, are commonly discussed in relation to this species. The fir-spruce type occupies about the same area of lodgepole pine but generally does not elicit the same reaction from forest managers. It is a more significant type in the North than in the South, both in terms of area and volume.

Hardwoods are relatively insignificant in both area and volume, consisting of mostly cottonwood and aspen in Colorado and Utah.

104 billion cubic feet is the same as...

780 billion gallons!?

In 1970, CFL in the Rocky Mountain States contained an estimated wood volume of 104 billion cubic feet. About 92 billion cubic feet of it was in growing stock trees, and 88 billion of it was in softwood timber. The sheer magnitude of such numbers certainly exercises the imagination; 104 billion cubic feet would cover an area of 1 square mile (640 acres) with wood to a height of 3,730 feet! (Or if you prefer, it would be enough wood to fill a reservoir 10 miles long, 3.7 miles wide, and 100 feet deep.)

Northern softwood sawtimber dominates.

The 88 billion cubic feet of softwood growing stock is about three-fourths sawtimber, estimated at 355 billion board feet (International 1/4-inch log rule). The bulk of it is in Montana and Idaho and leans heavily toward Douglas-fir (84 billion board feet) and ponderosa pine (66 billion). In the Northern States the Douglas-fir sawtimber volume is nearly twice that of any other species; in the Southern, spruce accounts for nearly as much volume as ponderosa pine but is generally in small diameter trees. About 60 percent of the ponderosa pine sawtimber is in trees 19 inches diameter breast height (d.b.h.) and larger, whereas only about one-third the spruce volume is in the larger diameter classes.

Noncommercial Forest Land

Arizona, New Mexico, and Utah have large areas of unproductive pinyon-juniper.

The noncommercial forest land is made up of unproductive lands and those that for some reason are either unsuitable or unavailable for timber harvest. Most of the unproductive forest land is found in the southern Rocky Mountain States and consists largely of pinyon-juniper stands. Arizona, New Mexico, and Utah have the largest areas of unproductive forest; but Nevada has the largest proportion of unproductive land; in fact, only 2 percent of Nevada's forest land is considered productive.

WHAT'S BEEN HAPPENING

Removals

In the 1952-1970 period, removals from growing stock doubled...

Between 1952 and 1970, total removals of growing stock more than doubled to 1.1 billion cubic feet per year in the Rocky Mountain Survey Section (table 3). Sawtimber removals amounted to slightly more than 6 billion board feet in 1970 (table 4), of which only 50 million were hardwoods.

The greatest increase (as well as total volume removed) was on the National Forests, but industrial lands also supported a significant increase:

with the biggest increase from National Forests.

Owner group or class	Percent change (from 1952 to 1970)	Percent of total
National Forest	+237	68
Other public	+8	8
Industry	+78	16
Other private	-23	8
All owners	+113	100

Industry relies heavily on publicly owned timber...

Roundwood products output accounted for about 93 percent of total removals during the 1950-1970 period, the remainder being logging residues (5 percent) and "other removals" (2 percent) associated with withdrawals of forest land for nontimber uses. There was no appreciable difference in the distribution of these components among owner groups, and no significant changes are expected in the future. The northern Rocky Mountain States are currently supplying about 76 percent of the roundwood products from growing stock.

By 1970, sawtimber products output totaled about 5.6 billion board feet, compared with only 3.0 billion in 1952 (table 4). National Forests and other public lands contributed nearly three-fourths of the output, which is about proportional to public ownership of productive forest land in the Rocky Mountains.

even while overcutting its own land.

Cutting on industrial lands increased (fig. 5) during the 1952-1970 period, and was well in excess of growth. Products output from nonindustrial private lands dropped significantly, and by 1970 accounted for less than 500 million board feet of sawtimber, compared with nearly 650 million in 1952.

Table 3.--Trends and projected changes in timber removals from growing stock by owner class in the Rocky Mountains

Owner class	Species group	1952	1962	[illegible]	1986	1990	2000	2010	2020
		Million cubic feet							
National Forest									
	Softwoods	[illegible]	411.4	[illegible]	[illegible]	751.0	746.5	742.8	740.0
	Hardwoods	1.7	2.8	[illegible]	[illegible]	23.6	28.1	31.8	34.6
	Total	230.0	414.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other public									
	Softwoods	79.1	85.0	*85.6*	51.6	75.9	111.6	111.6	111.6
	Hardwoods	.3	.4	*.1*	2.2	3.9	6.5	6.5	6.5
	Total	79.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Forest industry									
	Softwoods	104.3	134.0	[illegible]	158.7	136.3	106.4	106.4	106.4
	Hardwoods	.1	.2	[illegible]	1.1	1.5	1.2	1.2	1.2
	Total	104.4	134.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other private									
	Softwoods	121.3	[illegible]	[illegible]	61.5	112.9	186.1	186.1	186.1
	Hardwoods	.5	.6	[illegible]	6.4	13.7	24.4	24.4	24.4
	Total	121.8	106.8	[illegible]	[illegible]	126.6	210.5	[illegible]	[illegible]
All owners									
	Softwoods	533.0	737.8	*1,128.2*	1,028.0	1,076.1	1,150.6	1,146.9	1,144.1
	Hardwoods	2.6	4.5	[illegible]	[illegible]	42.7	[illegible]	63.9	66.7
	Total	535.6	741.3	*1,140.1*	1,056.6	1,118.8	1,210.8	1,210.8	1,210.8

Table 4.--Trends and projected changes in components of sawtimber removals by owner class in the Rocky Mountains

Owner class	Component	1952	1962	[illegible]	1986	1990	2000	2010	2020
		[illegible]							
National Forest									
	Timber products	1,283	2,260	[illegible]	3,651	3,469	3,315	3,186	3,081
	Logging residues	72	[illegible]	[illegible]	[illegible]	189	179	171	164
	Other removals[2]	27	[illegible]	[illegible]	134	173	207	240	271
	Total removals	1,382	[illegible]	[illegible]	3,985	3,831	[illegible]	[illegible]	[illegible]
Other public									
	Timber products	427	446	*461*	177	297	423	424	42[illegible]
	Logging residues	27	28	[illegible]	13	[illegible]	24	24	[illegible]
	Other removals	[illegible]	9	[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]
	Total removals	462	483	[illegible]	[illegible]	[illegible]	471	471	471
Forest industry									
	Timber products	[illegible]	740	[illegible]	[illegible]	5[illegible]	41[illegible]	415	41[illegible]
	Logging residues	38	46	[illegible]	46	[illegible]	24	23	[illegible]
	Other removals	12	15	[illegible]	41	[illegible]	2[illegible]	23	[illegible]
	Total removals	654	801	*1,064*	617	[illegible]	4[illegible]	461	4[illegible]
Other private									
	Timber products	639	536	[illegible]	204	421	668	670	671
	Logging residues	40	34	*31*	15	25	[illegible]	36	[illegible]
	Other removals	13	10	[illegible]	55	[illegible]	[illegible]	37	[illegible]
	Total removals	692	582	[illegible]	[illegible]	4[illegible]	743	743	74[illegible]
All owners									
	Timber products	2,953	3,984	[illegible]	4,762	4,756	4,819	4,695	4,592
	Logging residues	177	241	[illegible]	274	266	265	254	244
	Other removals	60	79	*137*	277	245	291	323	354
	Total removals	3,1[illegible]	4,1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[1]International 1/4-inch rule.

[2]Other removals are assumed to come mainly from TSI work, and therefore much of the volume comes from trees smaller than sawtimber size. The direct conversions of cubic-foot volumes to board-foot volumes, therefore, are not particularly meaningful but are shown here for convenience.

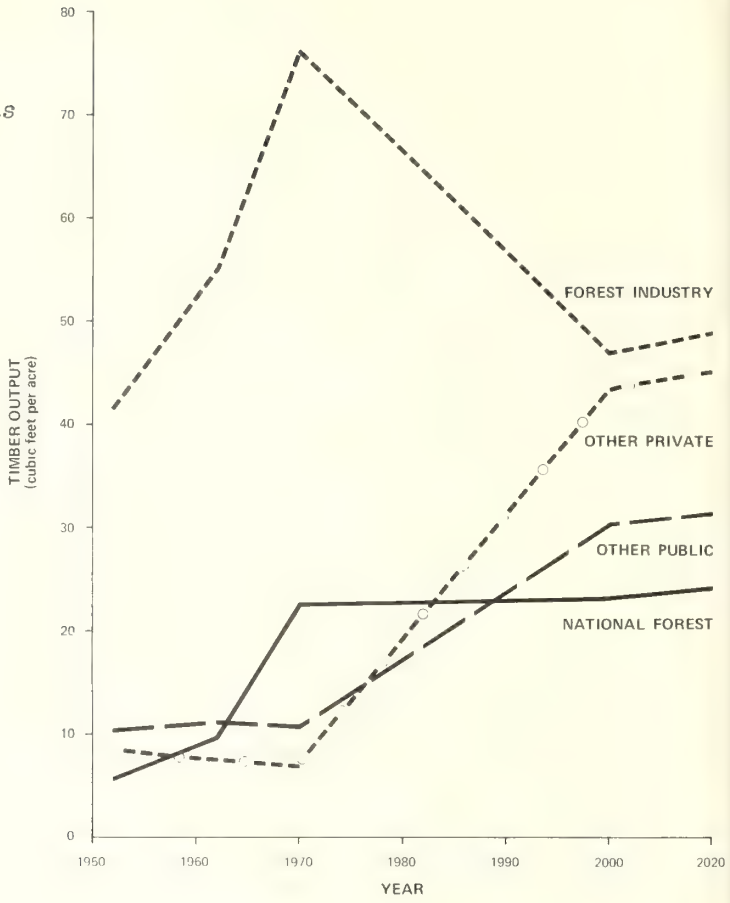


Figure 5.--*Trends and projections of timber products output by owner class in the Rocky Mountains.*

The projected decrease in cutting on industrial lands and the sharp projected increase for nonindustrial private and "other public" owners are based on the assumption that by the year 2000, these owners will balance cut with growth.

Mortality

Mortality in Rocky Mountain forests is high...

In 1970 the loss of growing-stock volume to mortality totaled some 613 million cubic feet (table 5), nearly three-fourths the volume that went into roundwood products. Sawtimber volume losses amounted to 2.5 billion board feet (table 6), almost half the roundwood products output from sawtimber. Theoretically, if all mortality could be salvaged, the annual timber supply could be increased by about 45 percent. Unfortunately, very little mortality is in fact salvaged, and it is unlikely that much of it could or will be.

mostly because of insects and fire.

Bark beetles can take most of the credit for the dead trees dotting the forest landscape. In the Northern States, Douglas-fir beetle and larch casebearer caused much of the 392-million-cubic-foot loss in 1970. In the Southern, mountain pine and spruce beetles accounted for a good

Table 5.--Annual mortality of growing stock on commercial forest land in the Rocky Mountain States by region and owner group, 1970

Region	All owners	National Forest	Other public	Forest industry	Other private
	Thousand cubic feet				
North. Rocky Mt. States	392,099	279,799	39,659	22,508	50,133
South. Rocky Mt. States	220,635	127,035	33,774	1,473	58,353
All Rocky Mt. States	612,734	406,834	73,433	23,981	108,486

Table 6.--Annual mortality of sawtimber on commercial forest land in the Rocky Mountain States by region and owner group, 1970

Region	All owners	National Forest	Other public	Forest industry	Other private
	Thousand board feet, International 1/4-inch log rule				
North. Rocky Mt. States	1,650,780	1,225,780	155,646	99,562	169,792
South. Rocky Mt. States	824,202	500,202	124,049	5,445	194,506
All Rocky Mt. States	2,474,982	1,725,982	279,695	105,007	364,298

portion of the roughly 221 million cubic feet of mortality. The losses to these insects are distributed about the same as the area of CFL--roughly 60 and 40 percent in the North and South, respectively.

The commercial species most affected are Douglas-fir, western larch, ponderosa pine, lodgepole pine, and Engelmann spruce.

In addition to the large volumes of timber lost to insects, in 1970 about 391 million board feet of sawtimber went up in smoke. It was a bad fire year, especially in Idaho and Montana, which sustained 95 percent of the loss. Over half the fires were started by lightning, but if people had been more careful, up to 164 million board feet might have been spared. In terms of the industrial pocketbook,

fire losses in 1970 were valued at between 12 and 16 million dollars.

There is a more subtle kind of mortality that has an important impact on timber supplies--suppression mortality. Trees that die from lack of sufficient light in overcrowded stands usually contain little volume, but in some areas they die in enormous numbers. While there is no salvable volume associated with the death of these trees, such losses represent useless growth that could have been redirected to trees in a position to grow to merchantability.

Growth

The productive capability under present management of CFL in the Rocky Mountain States is reflected by the growth data. Gross growth of growing stock in 1970 totaled nearly 2 billion cubic feet, or about 35 cubic feet per acre (table 7). This is a conservative estimate because of an undetermined amount of suppression mortality.

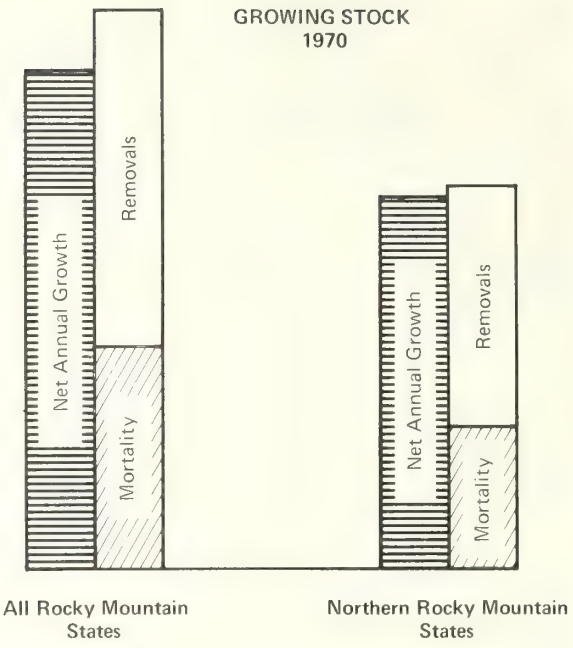
With estimated mortality of about 11 cubic feet per acre, the average net annual growth of growing stock on the 56.6 million acres of CFL was about 24 cubic feet per acre in 1970 and for sawtimber, 90 board feet. The resulting 3.7 board foot-cubic foot ratio of growth carries the implication that much of the growth is occurring in the lower diameter classes, an outwardly good sign. However, closer examination reveals that much of the growth consists of small increments on large numbers of trees in small-diameter stands, many of which are stagnated (fig. 6). The value of such growth is open to serious question.

Nearly three-fourths of the net annual growing stock and sawtimber growth is in the Northern States (table 7 and 8). Putting it another way, roughly 60 percent of the area accounts for 75 percent of the net annual growth.

Table 7.--Gross and net annual growth of growing stock on commercial forest land in the Rocky Mountain States by region and owner group, 1970, in thousand cubic feet

Ownership	North. Rocky Mt. States		South Rocky Mt. States		All Rocky Mt. States	
	Gross	Net	Gross	Net	Gross	Net
National Forest	823,667	543,868	365,809	238,774	1,189,476	782,642
Other public	172,713	133,054	67,696	33,922	240,409	166,976
Forest industry	126,307	103,799	3,422	1,949	129,729	105,748
Other private	288,380	238,247	125,882	67,529	414,262	305,776
All owners	1,411,067	1,018,968	562,809	342,174	1,973,876	1,361,142

Figure 6.--*Although the growth per acre of this stagnated stand is at an acceptable level, the growth per stem is all but insignificant.*



The growth picture in relation to total removals and mortality is not encouraging at the present time, particularly in the northern Rocky Mountain States. Removals (733.5 million cubic feet) plus mortality (392.1 million cubic feet) exceeded growth by some 106.6 million cubic feet in 1970. The situation suggests a real need for some "preventive medicine" that would substitute net growth for mortality. For example, early stocking control could transfer suppression mortality into the growth column.

In addition, the salvage of dead material deserves attention for several reasons: It could (1) help bring growth and removals into balance; (2) allow for increased wood supplies without reducing growing-stock inventory; (3) reduce costs of management activities such as fire protection and planting; and (4) help compensate for a dwindling land base for timber production.

Table 8.--Gross and net annual growth of sawtimber on commercial forest land in the Rocky Mountain States by region and owner group, 1970, in thousand board feet (International 1/4-inch rule)

Ownership	North. Rocky Mt. States		South Rocky Mt. States		All Rocky Mt. States	
	Gross	Net	Gross	Net	Gross	Net
National Forest	3,265,264	2,039,484	1,566,281	1,066,079	4,831,545	3,105,563
Other public	629,492	473,846	217,102	93,053	846,594	566,899
Forest industry	543,462	443,900	9,876	4,431	553,338	448,331
Other private	967,046	797,254	357,022	162,516	1,324,068	959,770
All owners	5,405,264	3,754,484	2,150,281	1,326,079	7,555,545	5,080,563

WHAT'S AHEAD

Projecting into the future is better than prophesying about it.

Prophecies are statements about the future made without data; it is their nature to be short, blunt, and usually devastating. Predictions, on the other hand, are made either with or without data and allow the brave and foolish to "stick their necks out."

Projections about future situations merely state what can be expected if certain well-founded assumptions hold true--but there is no guarantee that these assumptions will hold true.

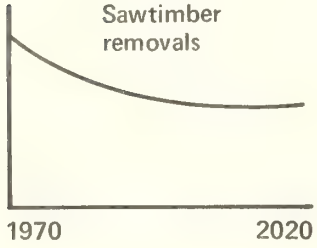
Our look at the future is a projection, nothing more. It describes the probable consequences of continuing the current (1970) forestry posture in the Rocky Mountain States, assuming certain expected changes in the commercial timber base.

In 1970 about 70,000 acres were regenerated and 92,000 received timber stand improvement work. Other measures, such as commercial thinning and prescribed burning, are being increasingly used, but no good data are available on the extent and location of these activities.

Because we are unable to predict or prophesy the future levels of timber growing activity, protection, and utilization, our projections of future timber supplies are predicated on the assumption that forestry in the Rocky Mountains will continue about as it was in 1970. That is, regeneration and timber stand improvement efforts will remain about the same (70,000 and 92,000 acres, respectively), and the 1970 allowable cut of 775 million cubic feet will continue to be removed on an even-flow basis from the National Forests. For all other owners, we assumed that by the year 2000 removals will be brought into balance with growth.

In addition to assumptions about continuation of the 1970 level of management (regeneration and thinning), we made similar assumptions on the profiles of mortality and product removals. That is, we assumed the diameter distribution of trees cut or dying in the future would be about the same as in 1970.

There is a shortage of large trees...



and a lagging thinning program.

If cubic-foot removals are continued at the 1970 level of allowable cut and with current levels of management, sawtimber harvest will probably decrease 8 percent or more by the year 2000 (table 9). A possible exception is the Intermountain Region (Forest Service, Region 4), which has a relatively larger inventory of big trees. There simply aren't enough large trees to sustain the current sawtimber cut over the Rocky Mountain section far into the future.

Continuing removals at the 1970 rate would require cutting more heavily in the smaller diameter classes as old growth is liquidated. But even with heavier cutting in smaller diameter classes, a buildup in basal area of small trees with accompanying slow growth and significant suppression mortality appears inevitable without at least a fivefold increase in precommercial thinning (fig. 7). One of the most unattractive consequences of harvesting smaller diameter trees is lower quality saw logs and veneer logs.

There are some factors affecting future timber supplies and output of sawtimber from National Forests in the Rocky Mountains that are not apparent in the data.

Table 9.--Projected sawtimber removals on National Forest lands by Forest Service Regions[1]

Forest Service Region	1970 Removals, million cu. ft. (Projection base)	Projected sawtimber removals[2]				
		1970	1980	1990	2000	2020
		Million board feet				
Northern	328	*1,583.4*	1,657.0	1,609.8	1,576.9	1,548.3
Rocky Mountain[3]	192	*1,080.7*	987.0	934.2	890.9	820.5
Intermountain[4]	143	*668.5*	772.8	756.8	739.2	708.8
Southwestern	112	*641.5*	568.0	530.2	493.5	438.3
Total	775	*3,974.1*	3,984.8	3,831.0	3,700.5	3,515.9

[1]Assuming 1970 level of management, removal of the allowable cubic-foot cut, no change in area of CFL, and 1970 relative prices and costs.

[2]Units are in International 1/4-inch rule. Sawtimber is defined to include trees 9 inches and larger d.b.h. (11 inches for hardwoods); this is not consistently used locally in defining allowable sawtimber cut.

[3]Allowable sawtimber removals in this region exceed actual cut.

[4]As explained in the text, because of data inadequacies, the projected increase in possible sawtimber removals for the Intermountain Region may not be realistic.

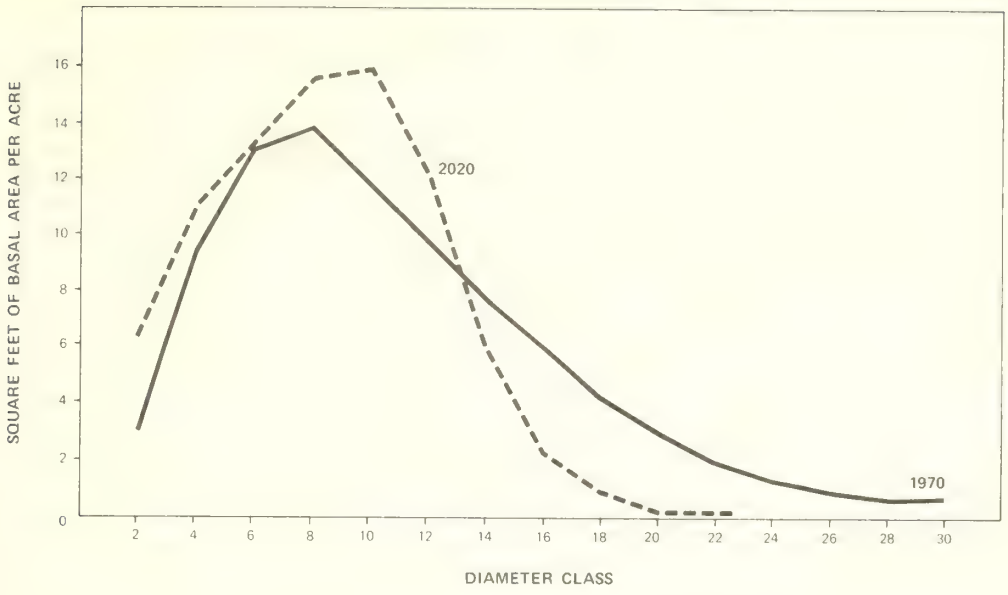


Figure 7.--*Present (1970) and projected (2020) basal area per acre by diameter class. The projected stand table for 2020 assumes continuing management at the 1970 level.*

Actual output will be affected by the speed with which sales can be accomplished...

For example, since 1970, changes in utilization standards (reducing minimum diameter of sawtimber to 7 inches in some areas) have resulted in upward revisions of allowable sawtimber cut in the Northern Region (Forest Service, Region 1). However, actual removals have been some 200 million board feet below the allowable. One reason is that the requirement of the National Environmental Policy Act (NEPA) to provide impact statements for individual timber sales has slowed down contract letting. Another is current budgetary constraints that preclude the hiring of necessary manpower. The result is that timber sales in 1971 dropped to 1.1 billion board feet, a reduction of 500 million board feet from the previous year.

and access to timber can be gained.

Still another factor that hinders meeting the allowable cut is the current moratorium on harvesting in roadless areas that contain much of the sawtimber volume. Also, in the Rocky Mountains the costs for roads and other facets of timber development are high. Depending on the difficulty of construction, the quality of the road, and the amount of timber serviced, costs could vary from $10 to well over $20 per thousand board feet. Not all such expenditures can be considered costs for timber extraction, however. Possible benefits from increased fire protection and enhanced recreation values should also be considered.

As of December 1972 there were some 11 million acres of CFL on nearly 27 million acres of roadless areas under

study for possible inclusion in the Wilderness System. Of that amount, however, only about 6 million acres were considered as favorably suited for Wilderness use; at stake is an annual allowable cut of about 154 million board feet of timber. This is a sizable amount, even though it represents less than 4 percent of the 1970 sawtimber removals.

However, any anguish over the prospect of such a "loss" should be tempered with the knowledge that on CFL in 1970, twice the amount of wood was left in the woods as logging residue, and about 12 times that much sawtimber (2.6 billion board feet) was lost to mortality.

In general, the projected trends in removals for National Forests under present management levels indicate:

Sawtimber removals must drop...

1. The present level of sawtimber cut cannot be maintained, except perhaps in Region 4. Even there, however, because inventory data for some forests are nearly 10 years old and the Region has recently experienced serious insect problems and heavy timber losses, the mortality rates are probably understated and the projected increase in sawtimber removals may not materialize.

harvested trees will be smaller...

2. Continuing the current allowable cubic-foot cut will result in increasingly greater volumes coming from smaller size-classes.

yet the thinning problem will increase.

3. In spite of increased removals of smaller material, there will be more volume in trees less than 12 inches d.b.h., unless there is a substantial increase in precommercial thinning. This will further aggravate the problems of overstocking and slow growth that already exist in many parts of the Rocky Mountains.

Other Owners

Projections for other owner groups assumed a balance of growth and removals by the year 2000. On public lands this means an increase in removals, but with a larger portion coming from smaller trees.

Other owners can provide about one-third of the cubic-foot supply that will be available by 2000.

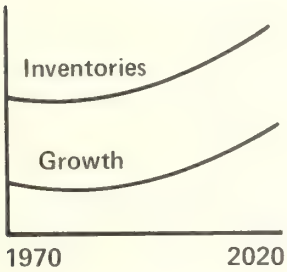
Because removals from industrial lands have exceeded growth for at least two decades, these lands cannot be relied upon to provide much of the future sawlog output--the volumes simply are not there.

Other private lands could increase their contribution to a level that would equal growth, but considering the apparent reluctance of these owners to cut in the past, future prices will likely influence cutting rates.

In Total

Sawtimber removals will be lower and trees cut will be smaller, although cubic-foot inventories will increase.

The net effect of maintaining the 1970 level of removals on National Forests and balancing removals and growth on other lands will be a gradual increase in growing-stock inventory. This will be due to increased growth on National Forests and removals below the expected net growth rate.



Continuing the level of management possible with current budgets would provide about 1.4 billion cubic feet (about 5.3 billion board feet of sawtimber) annually. However, maintaining that level of product removals would cause a reduction in sawtimber harvest because of the necessity of cutting smaller trees. In addition, stacking up basal area in smaller diameter classes will only add to already large areas of stagnated, low- or no-growth stands found throughout the Rocky Mountains.

National Forests will provide most of the timber, but administrative requirements may slow the pace at which output can be realized.

Heavy reliance on National Forests for sawtimber supplies could be an important factor in timber output in the Rocky Mountains in the near future. Legislative requirements impose limitations on the speed with which sales can be accomplished under current manpower and funding. Also, the proximity of harvestable timber to markets may have some influence on sales at current prices. Indications are that, since 1970, sales and removals have dropped substantially in some Regions. Therefore, current and prospective financing for sale administration and road development on National Forests may be a key element in interpreting the timber supply outlook.

Opportunities for Increasing Timber Supplies

Land use, utilization, and management activities...

Three basic factors will influence future timber supplies in the Rocky Mountains: (1) land-use policies and the effectiveness of coordinated programs for joint resource use; (2) technological advances in harvesting and utilization; and (3) the extent to which management activities (including protection and harvesting) can be and are applied. Adequate manpower, money, and ecologically and esthetically acceptable management practices are fundamental to successful timber-growing programs.

still hold the key to future timber supplies.

There is nothing particularly new about the preceding statements concerning timber supply. However, some of the implications in these statements are new, particularly

those regarding the influence the public holds in relation to land-use policies, and timber management and harvesting activities.

Land-use policies reflecting public goals will largely dictate the size and character of the timber-growing base, simply because three-fourths of the CFL in the Rocky Mountains is publicly owned. During the past few years the amount of land that could and should be included in the timber base for purposes of estimating allowable cut has received much judicial, emotional, and scientific attention. At present, there is no reason to expect the area of forest land suitable and available for timber production will be any greater than 47.5 million acres after 1980. Nor are there many reasons to think it will be less than that. Given this area to rely on, the timber supply will depend on what is done with that land.

The public's influence on timber supply does not end with land-use policies and the size of the timber-growing base, however. Public disagreement with the nature or consequences of timber management activities can effect delays and inefficiencies or even prevent getting the job done (fig. 8, 9).

Figure 8.--*Some harvesting operations, such as this operation invite public attention.*

Figure 9.--*Some others don't.*

For example, there are situations in which clearcutting is the most reasonable approach to harvest and regeneration without inordinately large dollar investments. However, the public's notable lack of enthusiasm for this practice can create problems for the timber manager. In some situations, rather than clearcut and regenerate naturally, a less severe harvesting scheme can be used and then seedlings planted. But the cost for this kind of operation is higher.

Getting nonstocked land into production would increase supplies, but right now...

On the other hand, a stand heavily infected with mistletoe cannot be replaced by a disease-free one unless the old stand is clearcut, the slash and debris burned, and the area planted.

At this point the size of the timber base is probably not as important as whether the land is in productive condition. In 1970 there were about 2.7 million acres of nonstocked productive land in the Rocky Mountains. If the lands were in production at even the present growth

rate of 24 cubic feet per acre per year, timber supplies would theoretically be increased by some 55 million cubic feet annually.

land is being cut faster than it can be regenerated.

Are the nonstocked areas awaiting regeneration likely to be back in production very soon? Probably not. The 2.7 million acres represent the backlog as of 1970. To generate the present level of roundwood output from the forest, about 247,000 acres are cut over annually. The present rate of regeneration of nonstocked land, including that cut over in the recent past, is about 82,000 acres. The planting and seeding efforts account for nearly 70,000 acres, and only about 12,000 acres are successfully regenerated naturally.

A sixfold increase in regeneration activities is needed.

If the current trend continues, the 2.7 million acres will blossom into more than 4 million acres of nonstocked land by 1980. To prevent this kind of galloping desolation would take a regeneration program about six times the magnitude of the 1970 program. Such an effort would, before 1980, eliminate the backlog and help assure more prompt regeneration of areas yet to be cut.

There are four basic ways to increase timber supplies...

With a fixed area of productive forest land, there are only a few ways in which output from that land can be increased over a given period of time. First, the rotation can be shortened by reducing the regeneration period. Second, early stocking control and other measures can shorten the precommercial growing period. Third, losses from fire, insects, and diseases can be decreased. Fourth, better utilization at the mills and more careful harvesting operations in the woods can reduce waste.

Shorten the rotation, shorten precommercial growing period, reduce losses, and improve utilization.

In terms of shortening the rotation, regeneration cycles are important and have been discussed somewhat already. Assuring that cutover areas are regenerated in 5 years or less could help considerably. Precommercial thinnings are lagging and an effort even five times as great as the current one probably would not be adequate. Increases in commercial thinnings are possible but there are nagging problems of stand accessibility, proximity to markets, and merchantability.

Insect, disease, and fire losses, if reduced, could substantially increase available supplies. The potential size of such increases has already been indicated by current loss figures.

It must be remembered that activities such as regeneration, thinning, and insect and disease control are more relevant to long-run timber supplies than to short-run supplies. The so-called "allowable-cut effect" can make it

possible to increase removals as soon as cultural treatments are initiated. Such increases could only be as large as the expected increase in growth per year resulting from the treatments. However, short-run capture of the expected growth increase requires a sufficient volume of wood in large-diameter trees. Without a large quantity of wood being "stored on the stump," there is no way to increase removals without cutting into growing-stock inventory. Thus, Rocky Mountain States, being without large volumes of big sawtimber trees, cannot capture the full "allowable-cut effect" to increase short-run timber supplies, even if massive investments in timber culture activities are made.

The best opportunity for increasing timber supply in the short run is to increase the level of utilization. Better harvesting methods could capture more of the material presently left unused or destroyed in the woods. New technology could make more material available for harvest, and more of the wood harvested convertible to usable products.

Readers expecting some magical numbers of probable or even possible future timber supplies from the Rocky Mountain States are due for a disappointment. Whatever sustainable timber supply level can be achieved in the future is obscured by a number of "ifs."

Future supplies hinge on several definable but unpredictable factors, such as:

1. How the public views and expresses its goals for publicly owned forest land.

2. How Congress interprets those goals, and reacts to provide both dollars and manpower.

3. How managers interpret the same goals and plan for their accomplishment.

4. How effectively the funds provided by Congress are used for timber management activities and in meeting environmental goals.

5. How private owners view their productive land and the incentives they have for contributing more to the timber supply.

Once the smoke has cleared on the land-use issue and planning is underway to get the most out of the forest with the money provided, the effective use of money will depend upon how well alternative projects are evaluated.

To design a good program for increasing timber supply within the constraints of NEPA and multiple use, management requires good planning information.

The need to evaluate alternative programs for timber output in relation to land-use policy is well recognized. However, the kinds of resource inventories required to provide appropriate information and the high cost of obtaining and evaluating that information are not so well recognized. Present inventories do not deal adequately with the question of availability of forest land for timber use, which is basic to realistic timber supply appraisals. Nor do these inventories provide the kind of data necessary to make meaningful evaluations of the consequences of alternative resource management programs.

This is true for all forest resources, not just timber. One of the key issues in forest land management is being able to demonstrate how manipulating one resource affects the others. For example, will attempts to produce more wood on an area result in more, less, or the same amount of forage? Will such attempts degrade or enhance water quality? Answering such questions requires resource data unlike that which has been gathered in the past.

It is a bit presumptuous to get excited about the possible consequences of certain programs and policies if the consequences are estimated from some general data that were not intended to be used for such purposes. About the best that can be done is to define the general direction the present program is heading.

To increase timber supplies, forest land managers, the public, and Congress will have to become more serious about it.

If money, manpower, and technology are available and used effectively, chances are good that future timber supplies can be increased in the Rocky Mountain States in spite of the reduction in the size of the timber base. At the same time, the value of nontimber resources can be greatly enhanced. But it is obvious that more thoughtful management effort will be needed to meet these goals, as well as a greater commitment on the part of the public and the Congress.

APPENDIX

Glossary

Forest Survey Tables 10–55

Glossary

Land Use Classes

Forest land — Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparison of basal area and/or number of trees, by age or size and spacing with specified standards. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet in width.) Also see definitions for land area, commercial forest land, stocking, unproductive forest land, and water.

Commercial forest land — Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying as commercial forest land have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Deferred forest land — National Forest lands that meet productivity standards for commercial forest, but are under study for possible inclusion in the Wilderness System.

Unregulated forest land — Portions of commercial forest land and the noncommercial forest land which will not be utilized for sustained timber production.

Noncommercial forest land — (1) Unproductive forest land incapable of yielding crops of industrial wood because of adverse site conditions, and (2) productive-reserved forest land.

Productive-reserved forest land — Forest land sufficiently productive to qualify as commercial forest land, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Unproductive forest land

Forest land incapable of producing 20 cubic feet per acre of industrial wood under natural conditions, because of adverse site conditions. (Note: Adverse conditions include sterile soils, dry climate, poor drainage, high elevation, steepness, and rockiness.)

Nonforest land

Land that has never supported forests and lands formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1-to-40-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide, and clearings, etc., more than 1 acre in size, to qualify as nonforest land.)

Ownership Classes

Ownership

Property owned by one owner, regardless of the number of parcels in a specified area.

National Forest land

Federal lands which have been legally designated as National Forest or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands

Federal land administered by the Bureau of Land Management.

Indian lands

Tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

Miscellaneous Federal lands

Federal lands other than National Forest lands, lands administered by the Bureau of Land Management, and Indian lands.

Other Federal lands

Federal lands other than National Forest lands, including lands administered by the Bureau of Land Management, Bureau of Indian Affairs, and other Federal agencies.

State, County, and municipal lands

Lands owned by States, counties, and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Other public — All federal lands other than National Forest lands, and State, county, and municipal lands.

Farmer-owned lands — Lands owned by farm operators. (Note: These exclude land leased by farm operators from nonfarm owners, such as railroad companies and States.)

Forest industry lands — Lands owned by companies or individuals operating wood-using plants.

Forest Type and Tree Species

Forest types — A classification of forest land based upon the species forming a plurality of live-tree stocking. (Note: Types shall be determined on the basis of species plurality of all live trees that contribute to stocking; that is, up to a maximum of 16 percent at each plot point based upon a 10-point location.

Major forest type — A grouping of local forest types into about 10 eastern and 10 western groups. The groupings are based upon similar and associated species.

Commercial species — Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality, such as hawthorn and sumac, scrub willow and alder.)

Noncommercial species — Tree species of typically small size, poor form, or inferior quality which normally do not develop into trees suitable for industrial wood products.

Softwoods — Coniferous trees, usually evergreen having needles or scalelike leaves.

Hardwoods — Dicotyledonous trees, usually broad-leaved and deciduous.

Class of Timber

Growing-stock trees — Live trees of commercial species meeting specified standards of quality or vigor; excludes cull trees.

Rough trees — (1) Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer--now or prospectively--and/or do not meet Regional specifications for freedom from defect primarily because of roughness or poor form; (2) all live trees of noncommercial species.

Rotten trees — Live trees of commercial species that do not contain at least one 12-foot saw log, or two noncontiguous saw logs, each 8 feet long or longer--now or prospectively--and/or do not meet Regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume in a tree is rotten.

Cull — Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Salvable dead trees — Standing or down dead trees that are considered merchantable by Regional standards.

Mortality trees — Trees formerly growing stock dying from natural causes during a specified period, usually annually.

Diameters and Size Classes

Diameter classes — A classification of trees based on diameter outside bark, measured at breast height (4-1/2 feet above the ground). (Note: d.b.h. is the common abbreviation for diameter at breast height. Two-inch diameter classes are commonly used in Forest Survey, with the even inch the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h., inclusive.)

Tree size class — A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, and saplings and seedlings.

Seedlings — Live trees less than 1.0 inch in d.b.h.

Saplings — Trees 1.0 to 5.0 inches in d.b.h.

Poletimber trees — Trees at least 5.0 inches in d.b.h., but smaller than sawtimber size.

Sawtimber trees — Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches, and 11.0 inches for hardwoods.

Volume

Net volume — Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Growing-stock volume

Net volume in cubic feet to live sawtimber trees and live poletimber trees from stump to a minimum 4.0 inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

International 1/4-inch rule

The standard board-foot log rule adopted nationally by the Forest Service for the presentation of Forest Survey volume statistics.

Growth and Mortality

Gross growth

Annual increase in net volume of trees in the absence of cutting and mortality. Includes ingrowth and accretion.

Net annual growth

The increase in net volume of a specified size class for a specific year. (Note: Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus net volume of trees reaching the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten trees during the year.)

Ingrowth

The number or net volume of trees that grow large enough during a specified year to qualify as saplings, poletimber, or sawtimber. The measurement is at the size of entry into the size class.

Accretion

Annual increase in net volume of trees in a size class, and the increase in net volume of trees after reaching a measured size class during the year.

Mortality

Number or sound-wood volume of growing stock trees dying from natural causes during a specified period.

Timber Cut

Allowable cut

The volume of timber that could be cut on commercial forest land during a given period under specified management plans aimed at sustained production of timber products.

Timber removals

The net volume of growing stock trees removed from the inventory by harvesting, cultural operations, such as timber-stand improvement, land clearing, or changes in land use.

Timber products — Roundwood products and plant byproducts. (Note: Timber products output includes roundwood products cut from growing stock on commercial forest land, and from other sources, such as cull tree, salvable dead trees, limbs, and saplings, or from trees on noncommercial and nonforest lands, and from plant byproducts.)

Roundwood products — Logs, bolts, or other round sections cut from trees for industrial or consumer uses. (Note: Includes saw logs, veneer logs and bolts, cooperage logs and bolts, pulpwood, fuelwood, piling, poles, hewn ties, mine timbers, and various other round, split, or hewn products.)

Plant residues — Wood materials from manufacturing plants not utilized for some product. (Note: Includes slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screenings.)

Logging residues — The unused portions of trees cut or killed by logging.

Other removals — The net volume of growing-stock trees removed from the inventory by cultural operations, such as timber-stand improvements, land clearing, and changes in land use.

Rotation — The period of years between establishment of a stand of timber and the time when it is considered ready for cutting and regeneration.

Quality

Industrial wood — All roundwood products, except fuelwood.

Site

Site class — A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean annual growth of growing stock (not including thinnings) attainable in fully stocked stands at culmination of mean annual growth. Height-age relationships are usually used as indicators of the specified volume-site class.

Stand Size Classes

Stand-size class — A classification of forest land based on the size class of growing stock trees on the area, that is, sawtimber, poletimber, or seedlings and saplings.

(Note: Only those trees that contribute to no more than 16 percent stocking at a plot point, based upon a 10-point location, will be considered in determining stand-size class.)

Sawtimber stands

a. Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands

b. Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seeding stands

c. Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and/or seedlings.

Nonstocked land

d. Commercial forest land less than 16.7 percent stocked with growing-stock trees.

Table 10.--LAND AREAS IN THE ROCKY MOUNTAIN STATES, BY LAND CLASS, 1970

State	Total land area[1]	Total forest land area	Commercial forest land area				Noncommercial forest land area				Nonforest land area
			Total	Commercial	Deferred	Unregulated	Total	Unproductive reserved	Productive reserved	Unproductive	
	Thousand acres										
North. Rocky Mt. States:											
North Idaho	12,555.6	10,189.0	8,449.5	8,172.2	210.2	67.1	1,739.5	369.5	863.1	506.9	2,366.6
South Idaho	40,357.5	11,449.2	7,478.5	6,024.7	525.4	928.4	3,970.7	275.1	973.8	2,721.8	28,908.3
Western Montana	15,784.7	12,604.6	10,097.7	9,929.2	100.0	68.5	2,506.9	763.3	894.5	849.1	3,180.1
Eastern Montana	77,390.5	10,173.0	6,526.8	5,921.4	541.1	64.3	3,646.2	424.1	495.6	2,726.5	67,217.5
Western South Dakota	6,878.8	1,399.4	1,310.4	1,253.8	--	56.6	89.0	4.7	15.7	68.6	5,479.4
Wyoming	62,211.3	10,085.1	4,304.2	3,255.8	121.9	926.5	5,780.9	505.8	2,711.9	2,563.2	52,126.2
Total	215,178.4	55,900.3	38,167.1	34,557.1	1,498.6	2,111.4	17,733.2	2,342.5	5,954.6	9,436.1	159,278.1
South. Rocky Mt. States:											
Arizona	72,587.3	18,583.7	3,700.2	3,636.8	10.3	53.1	14,883.5	875.2	546.8	13,461.5	54,003.6
Colorado	66,412.1	22,534.7	12,286.1	9,039.5	702.4	2,544.2	10,248.6	455.9	537.5	9,255.2	43,877.4
Nevada	70,322.8	7,660.6	128.6	127.6	--	1.0	7,532.0	66.6	5.9	7,459.5	62,662.2
New Mexico	77,703.2	18,313.7	5,785.0	5,605.2	48.6	131.2	12,528.7	513.1	584.5	11,431.1	59,389.5
Utah	52,540.7	15,288.1	3,846.6	3,618.8	22.0	205.8	11,441.5	65.1	232.1	11,144.3	37,252.6
Total	339,566.1	82,380.8	25,746.5	22,027.9	783.3	2,935.3	56,634.3	1,975.9	1,906.8	52,751.6	257,185.3
Total all Rocky Mountain States	554,744.5	138,281.1	63,913.6	56,585.0	2,281.9	5,046.7	74,367.5	4,318.4	7,861.4	62,187.7	416,463.4

[1] From U.S. Bureau of the Census, Land and Water Area of the United States, 1970.

Table 11.--AREA OF COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY OWNERSHIP CLASS, 1970

Ownership class	North Idaho	South Idaho	W. Montana	E. Montana	Western S. Dakota	Wyoming	Total
				Thousand acres			
National Forest	4,686.5	5,049.3	6,175.0	3,424.7	901.0	1,772.5	22,009.0
BLM	178.8	322.4	155.4	322.6	5.6	393.8	1,378.6
Indian	42.8	8.7	371.2	249.0	--	123.8	795.5
Misc. federal	7.7	--	2.7	50.4	4.0	--	64.8
State	651.3	209.7	437.2	92.3	62.2	110.6	1,563.3
County and municipal	18.9	--	2.3	2.4	--	--	23.6
Forest industry	777.6	169.1	1,041.0	14.4	17.2	54.3	2,073.6
Farmer	631.0	146.1	468.7	1,483.7	222.8	619.8	3,572.1
Misc. private	1,177.6	119.4	1,275.7	281.9	41.0	181.0	3,076.6
All ownerships	8,172.2	6,024.7	9,929.2	5,921.4	1,253.8	3,255.8	34,557.1

Table 12.--AREA OF COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY OWNERSHIP CLASS, 1970

Ownership class	Arizona	Colorado	Nevada	New Mexico	Utah	Total
			Thousand acres			
National Forest	2,294.7	5,166.6	54.4	2,808.0	2,407.8	12,731.5
BLM	2.0	413.1	--	76.4	154.0	645.5
Indian	1,140.2	102.8	--	613.7	157.2	2,013.9
Miscellaneous federal	--	4.6	--	8.9	--	13.5
State	32.1	188.9	3.4	171.1	239.0	634.5
County and municipal	1.5	45.1	1.2	--	--	47.8
Forest industry	--	14.7	8.3	137.1	--	160.1
Farmer	81.8	2,635.9	1.8	1,549.8	537.8	4,807.1
Miscellaneous private	84.5	467.8	58.5	240.2	123.0	974.0
All ownerships	3,636.8	9,039.5	127.6	5,605.2	3,618.8	22,027.9

Table 13.--AREA OF COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY STAND-VOLUME CLASS AND OWNER GROUP, 1970

State and stand volume class[1]	All owner groups	National Forest	Other public	Forest industry	Other private
			Thousand acres		
North. Rocky Mt. States:					
North Idaho:					
Less than 1,500 bd. ft.	1,766.5	933.4	172.6	99.0	561.5
1,500 to 4,999 bd. ft.	1,171.8	649.6	110.3	76.4	335.5
More than 5,000 bd. ft.	5,233.9	3,103.5	616.6	602.2	911.6
All classes	8,172.2	4,686.5	899.5	777.6	1,808.6
South Idaho:					
Less than 1,500 bd. ft.	826.4	698.0	77.2	14.7	36.5
1,500 to 4,999 bd. ft.	1,990.5	1,002.4	159.5	48.0	80.6
More than 5,000 bd. ft.	3,307.8	3,348.9	304.1	106.4	148.4
All classes	6,024.7	5,049.3	540.8	169.1	265.5
Western Montana:					
Less than 1,500 bd. ft.	1,924.7	1,433.4	121.2	84.3	285.8
1,500 to 4,999 bd. ft.	2,821.7	1,395.2	400.3	291.4	734.8
More than 5,000 bd. ft.	5,182.8	3,346.4	447.3	665.3	723.8
All classes	9,929.2	6,175.0	968.8	1,041.0	1,744.4
Eastern Montana:					
Less than 1,500 bd. ft.	1,828.9	977.5	244.2	8.1	599.7
1,500 to 4,999 bd. ft.	1,464.2	1,014.8	268.8	4.7	157.9
More than 5,000 bd. ft.	2,114.7	1,432.4	203.7	1.6	512.0
All classes	5,321.4	3,424.7	716.7	14.4	1,765.6
Western South Dakota:					
Less than 1,500 bd. ft.	544.2	334.3	32.1	10.8	171.0
1,500 to 4,999 bd. ft.	661.4	512.5	39.7	6.4	92.8
More than 5,000 bd. ft.	58.2	54.2	--	--	--
All classes	1,263.8	901.0	71.8	17.2	263.8
Wyoming:					
Less than 1,500 bd. ft.	944.2	451.2	215.2	15.6	262.2
1,500 to 4,999 bd. ft.	1,431.7	468.8	407.3	31.8	523.8
More than 5,000 bd. ft.	884.9	85.4	6.3	2.7	790.5
All classes	3,260.8	1,005.4	628.8	54.3	1,576.3
Total Northern Rocky Mountain States					
Less than 1,500 bd. ft.	7,834.1	4,847.8	862.5	232.4	1,891.4
1,500 to 4,999 bd. ft.	9,515.3	5,043.4	1,385.9	457.7	2,428.3
More than 5,000 bd. ft.	17,424.3	13,344.8	1,577.0	1,377.6	2,124.9
All classes	34,773.7	23,236.0	3,825.4	2,067.7	6,444.6

[1] International 1/4-inch rule.

Table 13 (con.)

State and stand volume class[1]	All owner groups	National Forest	Other public	Forest industry	Other private
			Thousand acres		
South. Rocky Mt. States:					
Arizona:					
Less than 1,500 bd. ft.	467.8	409.7	11.6	--	46.5
1,500 to 4,999 bd. ft.	1,133.7	831.0	182.9	--	119.8
More than 5,000 bd. ft.	2,035.3	1,054.0	981.3	--	--
All classes	3,636.8	2,294.7	1,175.8	--	166.3
Colorado:					
Less than 1,500 bd. ft.	3,897.3	1,864.2	296.0	8.4	1,728.7
1,500 to 4,999 bd. ft.	1,537.1	1,076.7	96.6	2.4	361.4
More than 5,000 bd. ft.	3,605.1	2,225.7	361.9	3.9	1,013.6
All classes	9,039.5	5,166.6	754.5	14.7	3,103.7
Nevada:					
Less than 1,500 bd. ft.	14.1	7.8	0.1	1.3	4.9
1,500 to 4,999 bd. ft.	25.0	12.3	0.8	1.7	10.2
More than 5,000 bd. ft.	88.5	34.3	3.7	5.3	45.2
All classes	127.6	54.4	4.6	8.3	60.3
New Mexico:					
Less than 1,500 bd. ft.	1,042.8	644.7	133.7	17.8	246.6
1,500 to 4,999 bd. ft.	3,262.3	1,202.8	909.5	113.8	1,436.2
More than 5,000 bd. ft.	1,300.1	960.5	226.9	5.5	107.2
All classes	5,605.2	2,808.0	870.1	137.1	1,790.0
Utah:					
Less than 1,500 bd. ft.	1,[illegible]53.3	611.7	172.4	--	269.2
1,500 to 4,999 bd. ft.	957.5	726.5	83.0	--	148.0
More than 5,000 bd. ft.	1,608.0	1,069.6	294.8	--	243.6
All classes	3,[illegible]18.8	2,407.8	550.2	--	660.8
Total Southern Rocky Mountain States:					
Less than 1,500 bd. ft.	[illegible],476.4	3,538.1	[illegible]13.8	27.5	2,295.9
1,500 to 4,999 bd. ft.	[illegible],[illegible]15.0	3,849.3	872.8	117.9	2,075.6
More than 5,000 bd. ft.	8,[illegible]37.[illegible]	5,344.1	1,868.6	14.7	1,409.6
All classes	22,[illegible]27.9	12,731.5	3,355.2	160.1	5,781.1
Total all Rocky Mount. States:					
Less than 1,500 bd. ft.	14,[illegible]90.4	[illegible],361.9	1,476.1	259.9	4,198.9
1,500 to 4,999 bd. ft.	1[illegible],[illegible]28.9	[illegible],893.7	2,258.7	575.8	4,504.7
More than 5,000 bd. ft.	2[illegible],[illegible]8.3	17,[illegible]88.4	3,445.2	1,388.0	3,726.2
All classes	5[illegible],[illegible]85.8	34,[illegible]74.5	7,181.0	2,233.7	12,429.8

[1] International 1/4-inch rule.

Table 14.--AREA OF COMMERCIAL FOREST LAND IN NORTH IDAHO BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest						Other public					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir:												
Sawtimber	105.9	203.6	170.4	61.0	25.2	566.1	6.9	23.4	54.7	79.8	30.8	195.6
Poletimber	38.1	72.7	66.6	21.3	7.9	206.6	--	--	13.0	6.0	--	19.0
Sapling and seedling	20.3	58.5	68.6	17.9	19.4	184.7	--	--	24.2	6.0	6.2	36.4
Nonstocked	19.1	42.5	51.4	19.7	11.9	144.6	--	--	--	--	9.0	9.0
Total	183.4	377.3	357.0	119.9	64.4	1,102.0	6.9	23.4	91.9	91.8	46.0	260.0
Hemlock:												
Sawtimber	5.6	29.4	31.6	43.8	48.9	159.3	--	--	27.9	--	--	27.9
Poletimber	4.6	2.7	7.8	4.6	5.7	25.4	--	--	--	--	6.0	6.0
Sapling and seedling	.1	.4	.3	6.7	9.0	16.5	--	--	--	6.2	--	6.2
Nonstocked	.5	1.6	1.7	4.9	4.9	13.6	--	--	--	--	6.5	6.5
Total	10.8	34.1	41.4	60.0	68.5	214.8	--	--	27.9	6.2	12.5	46.6
Ponderosa pine:												
Sawtimber	32.1	58.2	71.8	16.3	13.8	192.2	--	8.5	27.2	27.5	13.1	76.3
Poletimber	8.2	13.2	4.3	1.3	.4	27.4	--	--	10.1	--	--	10.1
Sapling and seedling	.8	1.8	1.1	.3	.2	4.2	--	--	--	6.9	--	6.9
Nonstocked	1.7	3.5	3.9	1.0	.9	11.0	--	--	--	--	1.9	1.9
Total	42.8	76.7	81.1	18.9	15.3	234.8	--	8.5	37.3	34.4	15.0	95.2
White pine:												
Sawtimber	96.3	112.5	47.0	17.2	1.6	274.6	--	27.7	28.5	--	--	56.2
Poletimber	39.8	31.0	15.7	8.8	--	95.3	--	--	--	--	--	--
Sapling and seedling	15.5	25.4	12.5	4.6	--	58.0	--	13.0	--	--	--	13.0
Nonstocked	15.7	11.3	8.8	4.4	.5	40.7	--	--	--	--	--	--
Total	167.3	180.2	84.0	35.0	2.1	468.6	--	40.7	28.5	--	--	69.2
Lodgepole pine:												
Sawtimber	19.3	39.1	31.2	16.3	9.8	115.7	--	--	--	--	--	--
Poletimber	42.4	109.8	148.4	87.9	49.9	438.4	--	--	--	6.2	6.6	12.8
Sapling and seedling	31.8	66.7	82.8	45.7	24.6	251.6	--	--	--	--	3.7	3.7
Nonstocked	4.9	15.9	21.5	20.0	14.7	77.0	--	--	--	--	--	--
Total	98.4	231.5	283.9	169.9	99.0	882.7	--	--	--	6.2	10.3	16.5
Larch:												
Sawtimber	55.0	104.8	66.4	21.1	3.8	251.1	--	12.4	--	--	--	12.4
Poletimber	62.7	61.1	37.7	14.7	1.1	167.3	--	--	--	--	13.0	13.0
Sapling and seedling	22.5	55.9	21.6	1.8	.1	101.9	--	--	--	--	--	--
Nonstocked	11.9	14.1	10.6	2.2	--	38.8	--	--	--	--	--	--
Total	142.1	236.9	136.3	39.8	5.0	559.1	--	12.4	--	--	13.0	25.4
True firs:												
Sawtimber	60.1	107.1	157.7	109.9	49.0	483.8	--	43.7	115.5	83.7	6.2	249.1
Poletimber	9.4	16.2	36.4	24.8	9.0	95.8	--	--	--	--	--	--
Sapling and seedling	5.0	17.0	45.1	19.1	7.5	93.7	--	10.7	9.7	8.7	--	29.1
Nonstocked	5.1	12.9	17.6	9.7	3.9	49.2	--	--	--	--	--	--
Total	79.6	153.2	256.8	163.5	69.4	722.5	--	54.4	125.2	92.4	6.2	278.2
Fir-spruce												
Sawtimber	18.9	34.9	99.9	53.7	12.7	220.1	--	6.0	--	--	--	6.0
Poletimber	5.4	15.2	15.7	6.3	3.7	46.3	--	--	--	--	--	--
Sapling and seedling	4.9	24.0	40.8	17.4	8.5	95.6	--	--	--	--	--	--
Nonstocked	2.8	9.3	16.6	7.5	5.2	41.4	--	--	--	--	--	--
Total	32.0	83.4	173.0	84.9	30.1	403.4	--	6.0	--	--	--	6.0
Other softwoods:[1]												
Sawtimber	5.3	28.2	20.7	6.3	5.3	65.8	--	9.1	34.9	27.4	9.1	80.5
Poletimber	2.5	2.6	3.4	1.2	.9	10.6	--	--	--	7.7	--	7.7
Sapling and seedling	1.6	5.0	6.3	1.7	1.6	16.2	--	--	6.9	--	--	6.9
Nonstocked	.6	1.8	2.4	.6	.6	6.0	--	--	--	--	--	--
Total	10.0	37.6	32.8	9.8	8.4	98.6	--	9.1	41.8	35.1	9.1	95.1
Aspen:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Other hardwoods:[2]												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	7.3	--	7.3
Total	--	--	--	--	--	--	--	--	--	7.3	--	7.3
All forest types:												
Sawtimber	398.5	717.8	696.7	345.6	170.1	2,328.7	6.9	130.8	288.7	218.4	59.2	704.0
Poletimber	203.1	324.5	336.0	170.9	78.6	1,113.1	--	--	23.1	19.9	25.6	68.6
Sapling and seedling	102.5	254.7	279.1	115.2	70.9	822.4	--	23.7	40.8	27.8	9.9	102.2
Nonstocked	62.3	112.9	134.5	70.0	42.6	422.3	--	--	--	7.3	17.4	24.7
Total	766.4	1,049.9	1,446.3	701.7	362.2	4,686.5	6.9	154.5	352.6	273.4	112.1	899.5

[1]Principally western redcedar.
[2]Principally birch and cottonwood.

Table 14 (con.)

Forest type and stand-size class	Forest industry						Other private					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand board feet											
Douglas-fir:												
Sawtimber	15.4	50.2	29.3	47.0	6.2	148.1	10.7	27.8	171.4	207.7	27.8	445.4
Poletimber	--	--	--	--	6.5	6.5	--	--	--	--	6.6	6.6
Sapling and seedling	--	--	7.7	14.2	--	21.9	--	--	15.0	48.9	6.9	70.8
Nonstocked	--	--	--	19.5	--	19.5	--	--	6.9	33.5	9.0	49.4
Total	15.4	50.2	37.0	80.7	12.7	196.0	10.7	27.8	193.3	290.1	50.3	572.2
Hemlock:												
Sawtimber	--	6.1	--	6.2	6.0	18.3	--	9.3	9.	--	.4	78.7
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	12.4	--	--	6.5	18.9
Nonstocked	--	--	--	--	--	--	--	9.0	--	--	--	9.0
Total	--	6.1	--	6.2	6.0	18.3	--	30.7	9.0	--	26.9	66.6
Ponderosa pine:												
Sawtimber	--	8.2	1.0	25.3	.9	35.4	--	.3	.4	.3	43.	.1
Poletimber	--	--	--	--	--	--	--	10.8	--	--	--	10.8
Sapling and seedling	--	--	--	--	6.5	6.5	--	--	--	7.7	--	7.7
Nonstocked	--	--	--	--	--	--	--	--	6.9	31.5	.3	38.7
Total	--	8.2	1.0	25.3	7.4	41.9	--	18.1	.2	178.2	3.	344.3
White pine:												
Sawtimber	--	30.7	9.8	9.8	--	50.3	--	7.6	13.1	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	-	--	--	--	4.	--	4.
Nonstocked	--	--	--	--	--	--	--	--	--	--	6.5	6.5
Total	--	30.7	9.8	9.8	--	50.3	--	7.6	13.1	9.0	6.5	36.2
Lodgepole pine:												
Sawtimber	--	6.0	--	--	--	6.0	--	--	6.2	24.7	--	30.9
Poletimber	--	--	--	--	--	--	6.2	--	33.4	12.9	64.7	
Sapling and seedling	--	--	--	--	--	--	--	--	17.6	--	19.1	36.7
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	6.0	--	--	--	6.0	6.2	--	57.	37.6	32.0	132.1
Larch:												
Sawtimber	--	19.8	9.4	--	--	29.2	13.1	58.7	21.5	15.3	--	108.6
Poletimber	--	--	--	--	--	--	--	--	9.8	22.1	--	31.9
Sapling and seedling	--	--	--	--	--	--	--	--	8.4	16.5	--	24.9
Nonstocked	--	--	--	--	--	--	--	--	--	13.0	--	13.0
Total	--	19.8	9.4	--	--	29.2	13.1	58.7	39.	66.9	--	178.4
True firs:												
Sawtimber	--	34.4	83.4	131.1	7.7	256.6	--	31.7	86.5	66.2	46.	231.1
Poletimber	--	--	--	6.9	--	6.9	--	7.3	--	--	--	7.3
Sapling and seedling	--	9.9	25.3	7.7	--	42.9	--	--	--	25.8	10.3	36.1
Nonstocked	--	--	--	--	--	--	--	--	6.2	--	--	6.2
Total	--	44.3	108.7	145.7	7.7	306.4	--	39.0	92.	92.	57.	280.7
Fir-spruce:												
Sawtimber	--	--	7.7	--	--	7.7	--	6.1	--	6.9	--	13.0
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	6.	6.5
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	7.7	--	--	7.7	--	6.1	--	6.9	6.	19.
Other softwoods:/												
Sawtimber	15.3	6.2	28.5	35.6	22.3	107.9	6.2	19.0	42.3	34.6	8.7	100.7
Poletimber	--	--	--	--	--	--	--	--	7.1	--	6.	13.5
Sapling and seedling	--	--	--	7.7	--	7.7	--	6.2	7.3	--	--	13.5
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	15.3	6.2	28.5	42.7	22.9	115.6	6.2	21.	46.	34.6	14.	127.7
Aspen:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	6.	6.
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	-	6.	6.
Other hardwoods:/												
Sawtimber	--	--	6.2	--	--	6.2	--	-	--	6.	7.	13.
Poletimber	--	--	--	--	--	--	-	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	-	6.2	24.	31.0
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	6.2	--	--	6.2	--	--	--	12.4	31.	44.
All forest types:												
Sawtimber	30.7	161.6	175.3	254.4	43.7	665.7	30.0	163.5	408.4	504.5	153.9	1,260.3
Poletimber	--	--	--	6.9	6.5	13.4	6.2	18.1	29.3	55.5	25.	134.8
Sapling and seedling	--	9.9	33.0	29.6	6.5	79.0	--	18.6	48.3	114.1	80.3	261.
Nonstocked	--	--	--	19.5	--	19.5	--	9.0	20.	38.	45.2	112.
Total	30.7	171.5	208.3	310.4	56.7	777.6	36.2	209.2	506.0	752.1	305.1	1,808.6

Table 15.--AREA OF COMMERCIAL FOREST LAND IN SOUTH IDAHO BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest						Other public					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir:												
Sawtimber	7.5	18.3	103.9	657.5	1,142.9	1,930.1	--	11.4	37.8	140.7	60.4	250.3
Poletimber	--	--	--	4.3	46.3	50.6	--	--	--	--	4.3	4.3
Sapling and seedling	--	--	--	2.8	79.4	82.2	--	3.7	3.8	--	3.8	11.3
Nonstocked	--	--	--	--	28.4	28.4	--	--	--	4.3	3.8	8.1
Total	7.5	18.3	103.9	664.6	1,297.0	2,091.3	--	15.1	41.6	145.0	72.3	274.0
Hemlock:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	--	8.7	50.3	234.7	183.1	476.8	--	3.8	30.9	60.7	15.2	110.6
Poletimber	--	.1	.6	3.3	4.8	8.8	--	--	--	3.8	--	3.8
Sapling and seedling	--	--	--	21.4	26.1	47.5	--	--	--	7.6	3.6	11.2
Nonstocked	--	-	--	2.6	15.2	17.8	--	--	--	--	3.7	3.7
Total	--	8.8	50.9	262.0	229.2	550.9	--	3.8	30.9	72.1	22.5	129.3
White pine:												
Sawtimber	[illegible]	0	0	[illegible]	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Lodgepole pine:												
Sawtimber	[illegible]	--	--	100.9	602.5	703.4	--	--	3.8	8.1	15.2	27.1
Poletimber	-	--	--	27.9	185.4	213.3	--	--	--	8.1	16.8	24.9
Sapling and seedling	2.3	--	--	12.0	300.6	314.9	--	--	--	--	--	--
Nonstocked	--	--	--	--	12.8	12.8	--	--	--	--	--	--
Total	2.3	--	--	140.8	1,101.3	1,244.4	--	--	3.8	16.2	32.0	52.0
Larch:												
Sawtimber	1.[illegible]	[illegible].2	9.1	51.7	[illegible].8	74.7	--	--	--	--	--	--
Poletimber	--	-	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	10.6	10.6	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	1.[illegible]	[illegible].2	9.1	51.7	20.4	85.3	--	--	--	--	--	--
True firs:												
Sawtimber	[illegible].[illegible]	2.0	18.4	198.4	362.5	579.2	--	3.8	22.8	22.8	3.8	53.2
Poletimber	--	--	--	2.6	63.9	66.4	--	--	--	--	--	--
Sapling and seedling	-	--	.2	4.7	47.4	57.3	--	--	3.7	3.8	--	7.5
Nonstocked	--	--	--	--	4.9	4.9	--	--	--	--	--	--
Total	2.[illegible]	2.0	18.6	205.6	468.7	697.8	--	3.8	26.5	26.6	3.8	60.7
Fir-spruce												
Sawtimber	--	9.0	74.3	80.1	86.6	250.[illegible]	--	--	--	--	--	--
Poletimber	--	--	--	.1	5.7	5.8	--	--	--	--	--	--
Sapling and seedling	--	.1	.2	.5	6.2	7.0	--	--	--	--	--	--
Nonstocked	--	--	--	--	2.6	2.6	--	--	--	--	--	--
Total	-	9.1	74.5	80.7	101.1	265.4	--	--	--	--	--	--
Other softwoods:[1]												
Sawtimber	--	-	--	10.3	26.1	36.4	--	--	--	--	--	--
Poletimber	--	--	-	--	14.1	14.1	--	--	--	--	--	--
Sapling and seedling	-	-	--	-	31.2	31.2	--	--	--	--	--	--
Nonstocked	-	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	10.3	71.4	81.7	--	--	--	--	--	--
Aspen												
Sawtimber	--	--	--	.7	11.2	11.9	--	--	--	--	--	--
Poletimber	--	-	--	--	17.5	17.5	--	--	--	--	8.6	8.6
Sapling and seedling	--	--	--	--	2.7	2.7	--	--	--	4.3	--	4.3
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	.7	31.4	32.1	--	--	--	4.3	8.6	12.9
Other hardwoods:[2]												
Sawtimber	--	-	--	-	.4	.4	--	--	--	3.8	3.8	7.6
Poletimber	--	--	--	--	--	--	--	--	--	--	4.3	4.3
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	.4	.4	--	--	--	3.8	8.1	11.9
All forest types:												
Sawtimber	12.3	40.2	256.0	1,329.3	2,425.1	4,062.9	--	19.0	96.3	236.1	98.4	448.8
Poletimber	--	.1	.6	38.1	327.7	366.5	--	--	--	11.9	34.0	45.9
Sapling and seedling	2.3	.1	.4	46.4	504.2	553.4	--	3.7	7.5	15.7	7.4	34.3
Nonstocked	--	--	--	2.6	63.9	66.5	--	--	--	4.3	7.5	11.8
Total	14.6	40.4	257.0	1,416.4	3,320.9	5,049.3	--	22.7	102.8	268.0	147.3	540.8

[1] Principally whitebark-limber pine.
[2] Principally cottonwood.

Table 15 (con.)

Forest type and stand-size class	Forest industry						Other private					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir:												
Sawtimber	--	4.0	13.2	44.7	17.3	79.2	--	5.6	18.3	67.7	28.3	119.9
Poletimber	--	--	--	--	.5	.5	--	--	--	--	2.5	2.5
Sapling and seedling	--	1.1	1.4	--	1.3	3.8	--	1.7	1.8	--	1.8	5.3
Nonstocked	--	--	--	.6	1.3	1.9	--	--	--	2.4	1.9	4.3
Total	--	5.1	14.6	45.3	20.4	85.4	--	7.3	20.1	70.1	34.5	132.0
Hemlock:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	--	1.3	9.9	21.5	5.4	38.1	--	1.8	15.4	33.5	7.4	58.1
Poletimber	--	--	--	1.3	--	1.3	--	--	--	1.8	--	1.8
Sapling and seedling	--	--	--	2.7	1.1	3.8	--	--	--	[illegible]	1.7	5.4
Nonstocked	--	--	--	--	1.1	1.1	--	--	--	--	1.7	1.7
Total	--	1.3	9.9	25.5	7.6	44.3	--	1.8	15.4	35.2	10.8	63.2
White pine:												
Sawtimber	0	0	0	0	0	0		0	0	0	0	0
Poletimber	0	0	0	0	0	0		0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0		0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Lodgepole pine:												
Sawtimber	--	--	1.3	1.9	5.4	8.6	--	--	1.8	4.0	7.9	13.7
Poletimber	--	--	--	1.9	2.9	4.8	--	--	--	4.4	9.3	13.7
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	1.3	3.8	8.3	13.4	--	--	1.8	8.4	17.2	27.4
Larch:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
True firs:												
Sawtimber	--	1.4	8.1	8.0	1.3	18.8	--	1.9	11.1	11.4	1.8	26.2
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	1.1	1.4	--	2.5	--	--	1.7	1.4	--	3.1
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	1.4	9.2	9.4	1.3	21.3	--	1.9	12.8	12.8	1.8	29.3
Fir-spruce												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Other softwoods: [1]												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Aspen:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	1.0	1.0	--	--	--	--	4.0	5.0
Sapling and seedling	--	--	--	.5	--	.5	--	--	--	.5	--	.5
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	.5	1.0	1.5	--	--	--	.5	4.0	5.5
Other hardwoods: [2]												
Sawtimber	--	--	--	1.4	1.3	2.7	--	--	--	1.0	1.5	2.5
Poletimber	--	--	--	--	.5	.5	--	--	--	--	2.5	2.5
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	1.4	1.8	3.2	--	--	--	1.0	4.0	5.0
All forest types:												
Sawtimber	--	6.7	32.5	77.5	30.7	147.4	--	9.3	46.6	114.6	46.8	217.3
Poletimber	--	--	--	3.2	4.9	8.1	--	--	--	6.2	19.3	25.5
Sapling and seedling[3]	--	1.1	2.5	4.6	2.4	10.6	--	1.7	3.5	8.4	3.5	16.7
Nonstocked	--	--	--	.6	2.4	3.0	--	--	--	2.4	3.6	6.0
Total	--	7.8	35.0	85.9	40.4	169.1	--	11.0	50.1	131.2	73.2	265.5

Table 16.—AREA OF COMMERCIAL FOREST LAND IN WESTERN MONTANA BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest						Other public					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir												
Sawtimber	6.4	235.6	442.8	220.7	131.2	1,036.7	--	--	16.8	140.0	119.5	276.3
Poletimber	6.3	56.1	176.1	51.6	27.5	317.6	--	--	1.7	5.1	56.0	62.8
Sapling and seedling	.8	21.0	121.2	45.2	16.0	204.2	--	--	--	11.6	--	11.6
Nonstocked	(1)	5.1	7.3	1.0	1.8	15.2	--	--	--	.4	1.5	1.9
Total	13.5	317.8	747.4	318.5	176.5	1,573.7	--	--	18.5	157.1	177.0	352.6
Hemlock												
Sawtimber	--	11.0	24.1	10.0	14.3	59.4	--	--	.5	1.0	.5	2.0
Poletimber	5.5	3.1	8.7	--	--	17.3	--	--	--	--	--	--
Sapling and seedling	--	.1	(1)	--	--	.1	--	--	--	--	--	--
Nonstocked	.1	.9	.9	.8	1.0	3.7	--	--	--	--	(1)	(1)
Total	5.6	15.1	33.7	10.8	15.3	80.5	-	—	.5	1.0	.5	2.0
Ponderosa pine												
Sawtimber	8.1	34.2	55.1	80.2	56.7	234.3	--	--	28.6	95.1	66.0	189.7
Poletimber	7.3	16.5	5.3	10.2	11.3	50.6	--	--	1.7	4.6	22.9	29.2
Sapling and seedling	--	4.5	15.8	6.5	1.1	27.9	--	--	--	--	4.9	4.9
Nonstocked	—	--	--	.1	1.2	1.3	--	--	—	.2	1.9	2.1
Total	15.4	55.2	76.2	97.0	70.3	314.1	--	--	30.3	99.9	95.7	225.9
White pine												
Sawtimber	2.8	14.2	[illegible]	1.4	--	25.5	--	--	1.8	.4	--	2.2
Poletimber	1.9	7.3	--	--	--	9.2	--	--	--	--	--	--
Sapling and seedling	--	3.0	--	--	--	3.0	--	--	--	--	--	--
Nonstocked	.1	.2	.2	--	--	.5	--	--	--	--	--	--
Total	4.8	24.7	6.8	1.4	--	38.2	--	--	1.8	.4	--	2.2
Lodgepole pine												
Sawtimber	1.7	124.1	281.8	163.2	44.6	615.2	-	--	--	4.2	7.0	11.2
Poletimber	9.7	131.0	[illegible]	295.9	203.7	1,145.6	--	--	--	26.1	95.9	122.0
Sapling and seedling	2.1	25.6	144.1	57.3	104.0	333.1	--	--	--	--	52.4	52.4
Nonstocked	(1)	1.0	7.6	5.4	1.3	15.3	--	--	--	.2	.1	.3
Total	13.3	281.7	438.8	521.8	353.6	2,109.2	--	--	--	30.5	155.4	185.9
Larch												
Sawtimber	62.2	110.1	120.1	77.0	0.5	369.9	6.6	14.5	21.9	57.7	18.2	118.9
Poletimber	25.6	54.8	59.7	22.6	—	167.7	--	--	--	14.1	--	14.1
Sapling and seedling	9.4	20.7	36.7	7.5	—	74.3	--	--	--	2.8	--	2.8
Nonstocked	5.3	8.6	10.3	5.0	--	29.2	--	--	--	2.8	--	2.8
Total	102.5	194.2	226.8	112.1	0.5	641.1	6.6	14.5	21.9	77.4	18.2	138.6
True firs:												
Sawtimber	[illegible]	94.7	[illegible]	115.9	116.6	571.1	--	--	1.7	3.6	2.9	8.2
Poletimber	--	27.6	[illegible]	36.0	37.7	151.8	--	--	(1)	(1)	.1	.1
Sapling and seedling	.6	34.1	74.2	23.9	36.1	168.9	--	--	.3	.5	.4	1.2
Nonstocked	.3	10.8	42.4	1.5	1.7	56.7	--	--	--	--	--	--
Total	9.9	167.2	402.0	177.3	192.1	948.5	--	--	2.0	4.1	3.4	9.5
Fir-spruce												
Sawtimber	10.2	71.6	87.0	67.4	23.1	260.5	--	1.0	4.9	19.1	12.9	37.9
Poletimber	--	20.0	11.5	.6	.8	32.9	--	--	(1)	.1	.2	.3
Sapling and seedling	1.2	10.9	32.2	8.6	2.6	55.5	--	--	--	.1	.5	.6
Nonstocked	.4	1.2	3.3	1.3	1.2	7.4	--	--	--	.7	2.8	3.5
Total	11.8	103.9	134.0	77.9	27.7	356.3	--	1.0	4.9	20.0	16.4	42.3
Other softwoods												
Sawtimber	3.0	12.8	15.7	20.5	33.8	85.8	--	--	1.5	2.0	.9	4.4
Poletimber	2.0	--	8.0	4.0	1.5	15.5	--	--	.4	.6	.3	1.3
Sapling and seedling	.4	1.9	4.4	4.4	.4	12.0	--	--	--	1.6	--	1.6
Nonstocked	--	--	--	.1	--	.1	--	--	--	--	--	--
Total	5.9	14.7	28.1	29.0	35.7	113.4	--	--	1.9	4.2	1.2	7.3
Aspen												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	(1)	.1	.1
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	(1)	.1	.1
Other hardwoods												
Sawtimber	--	--	--	--	--	--	--	--	--	.3	1.0	1.3
Poletimber	--	--	--	--	--	--	--	--	--	.2	.4	.6
Sapling and seedling	--	--	--	--	--	--	--	--	--	.1	.4	.5
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	.6	1.8	2.4
All forest types:												
Sawtimber	103.2	709.5	1,268.1	756.8	420.8	3,258.4	6.6	15.5	77.7	323.4	228.9	652.1
Poletimber	58.3	321.4	825.1	420.9	282.5	1,908.2	--	--	3.8	50.8	175.9	230.5
Sapling and seedling	15.0	121.8	428.6	153.4	160.2	879.0	--	--	.3	16.7	58.6	75.6
Nonstocked	6.2	27.8	72.0	15.2	8.2	129.4	--	--	--	4.3	6.3	10.6
Total	182.7	1,180.5	2,593.8	1,346.3	871.7	6,175.0	6.6	15.5	81.8	395.2	469.7	968.8

[1]Less than 0.05 thousand acres
[2]Principally western redcedar and whitebark-limber pine.
[3]Principally cottonwood.

Table 16 (con.)

Forest type and stand-size class	Forest industry						Other private					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Million board feet											
Douglas fir:												
Sawtimber	--	--	14.2	118.0	100.7	232.9	--	--	25.5	210.6	179.9	416.0
Poletimber	--	--	1.3	3.4	38.5	43.2	--	--	4.5	[illegible]	150.8	169.2
Sapling and seedling	--	--	--	5.4	--	5.4	--	--	--	31.7	--	31.7
Nonstocked	--	--	--	.4	1.2	1.6	--	--	--	1.1	3.9	5.0
Total	--	--	15.5	127.2	140.4	283.1	--	--	30.0	257.3	[illegible]	[illegible]
Hemlock:												
Sawtimber	--	--	.9	1.8	.8	[illegible]	--	-	..	1		..
Poletimber	--	--	--	--	--	--	--	-	--	--		-
Sapling and seedling	--	--	--	--	--	--	--	-	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--		
Total	--	--	.9	1.8	.8	[illegible]	-	--	.1	[illegible]		
Ponderosa pine:												
Sawtimber	--	--	60.3	200.4	139.4	400.1	--	-	47.0	156.6	[illegible]	312.4
Poletimber	--	--	1.1	3.0	14.7	18.8	--	[illegible]	3.5	9.2	46.4	59.1
Sapling and seedling	--	--	--	--	1.6	1.6	[illegible]	-	--	-	9.1	9.1
Nonstocked	--	--	--	.3	4.0	4.3	--	--	--	.4	[illegible]	[illegible]
Total	--	--	61.4	203.7	159.7	424.8	--	--	[illegible]	[illegible]	[illegible]	[illegible]
White pine:												
Sawtimber	--	--	6.2	1.5	--	[illegible]	--	--				
Poletimber	--	-	4.8	1.2	--	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Sapling and seedling	--	--	--	--	--	--	--	-	[illegible]	--	[illegible]	
Nonstocked	--	--	--	.5	.5	1.0	--	-	[illegible]	-	-	-
Total	--	--	11.0	3.2	.5	14.7	-	-	[illegible]	[illegible]	-	[illegible]
Lodgepole pine:												
Sawtimber	--	--	--	[illegible]	3.4	5.5	--	--	-	[illegible]	22.2	35.5
Poletimber	--	--	--	[illegible]	64.7	82.2	--	-	--	[illegible]	193.4	[illegible]
Sapling and seedling	--	--	--	--	17.1	17.1	--	--	--	--	61.7	61.7
Nonstocked	--	--	--	[illegible]	.4	1.9	--	--	-	4.5	1.1	[illegible]
Total	--	--	--	21.1	85.6	[illegible]	--	--	--	[illegible]	[illegible]	[illegible]
Larch:												
Sawtimber	8.1	17.9	26.9	71.3	[illegible]	146.7	11.5	[illegible]	[illegible]	102.0	[illegible]	210.0
Poletimber	--	--	--	20.4	--	20.4	--	--	--	64.4	--	64.4
Sapling and seedling	-	--	--	[illegible]	--	[illegible]	--	--	--	14.3	--	[illegible]
Nonstocked	--	--	--	1.5	--	1.5	—	—	—	1.2	-	1.2
Total	8.1	17.9	26.9	96.6	22.5	[illegible]	11.5	25.6	38.6	181.9	32.3	289.9
True firs:												
Sawtimber	--	--	--	[illegible]	[illegible]	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Poletimber	--	--	.1	.2	[illegible]	[illegible]	--	-	--	--	-	-
Sapling and seedling	--	--	--	--	--	--	--	-	--	--	--	
Nonstocked	--	--	--	--	--	--	--			-	-	--
Total	--	--	.1	[illegible]	.2	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Fir spruce:												
Sawtimber	--	.2	1.0	[illegible]	2.8	[illegible]	--	[illegible]	[illegible]	[illegible]	14.2	[illegible]
Poletimber	--	--	[illegible]	.1	.4	[illegible]	--	[illegible]	.1	1.2	[illegible]	5.5
Sapling and seedling	--	--	--	--	--	--	--	[illegible]	--	[illegible]	[illegible]	.1
Nonstocked	--	--	--	[illegible]	[illegible]	[illegible]	-	--	--	--	-	--
Total	--	.2	1.0	4.0	3.0	[illegible]	--	1.2	5.5	22.4	[illegible]	[illegible]
Other softwoods:—												
Sawtimber	--	--	4.1	5.2	1.9	11.2	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Poletimber	--	--	1.4	2.3	1.2	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Sapling and seedling	--	--	--	[illegible]	--	[illegible]	--	-	--	[illegible]	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	-
Total	--	--	5.5	13.7	3.1	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Aspen:												
Sawtimber	--	--	--	--	--	--	-	--	--	[illegible]	[illegible]	[illegible]
Poletimber	--	--	--	--	--	--	[illegible]	--				[illegible]
Sapling and seedling	--	--	--	--	--	--	[illegible]	--	--			[illegible]
Nonstocked	--	--	--	[illegible]	.1	.1	[illegible]	--	--	[illegible]	[illegible]	[illegible]
Total	--	--	--	[illegible]	.1	.1	--	--	--	[illegible]	[illegible]	[illegible]
Other hardwoods:—												
Sawtimber	--	--	--	.7	[illegible]	2.6	--	-	[illegible]	[illegible]	21.0	28.8
Poletimber	--	--	--	[illegible]	[illegible]	1.1	--	-	--	[illegible]	1.9	2.6
Sapling and seedling	--	--	--	[illegible]	[illegible]	1.1	--	--	--	[illegible]	[illegible]	[illegible]
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	1.3	3.5	4.8	--	-	--	[illegible]	[illegible]	[illegible]
All forest types												
Sawtimber	8.1	18.1	113.6	405.2	273.2	818.2	11.5	26.8	117.9	518.5	380.7	1,055.4
Poletimber	--	--	8.7	48.4	120.5	177.6	--	--	[illegible]	143.2	[illegible]	551.1
Sapling and seedling	--	--	--	15.3	19.5	34.8	--	--	--	46.7	[illegible]	119.0
Nonstocked	--	--	--	4.2	6.2	10.4	--	--	--	7.5	11.4	18.9
Total	8.1	18.1	122.3	473.1	419.4	1,041.0	11.5	26.8	126.1	[illegible]	[illegible]	[illegible]

Table 17.--AREA OF COMMERCIAL FOREST LAND IN EASTERN MONTANA BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest						Other public					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas fir:												
Sawtimber	5.3	55.7	166.2	234.4	164.7	626.3	--	--	--	44.2	102.7	146.9
Poletimber	--	2.9	49.5	81.5	67.0	200.9	--	--	--	5.1	54.7	59.8
Sapling and seedling	(1)	5.8	38.4	56.6	31.6	132.4	--	--	--	--	11.9	11.9
Nonstocked	.1	--	4.2	4.4	4.8	13.5	--	--	--	--	--	--
Total	5.4	64.4	258.3	376.9	268.1	973.1	--	--	--	49.3	169.3	218.6
Hemlock:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	5.2	5.2	7.9	51.1	37.1	106.1	--	--	--	22.4	165.0	187.4
Poletimber	--	--	1.9	20.9	15.0	37.8	--	--	--	--	53.3	53.3
Sapling and seedling	--	(1)	1.4	16.0	11.6	29.0	--	--	--	--	36.1	36.1
Nonstocked	--	--	2.3	27.7	25.1	55.1	--	--	--	--	23.7	23.7
Total	5.2	5.2	13.1	115.7	88.8	228.0	--	--	--	22.4	278.1	300.5
White pine:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Lodgepole pine:												
Sawtimber	1.6	71.1	288.6	364.1	80.1	803.3	--	--	--	10.5	34.4	44.9
Poletimber	(1)	44.3	200.0	301.2	99.3	645.4	--	--	--	12.0	48.0	60.0
Sapling and seedling	--	16.7	84.2	71.4	46.8	219.1	--	--	--	--	16.9	16.9
Nonstocked	(1)	6.0	9.9	19.9	8.9	44.7	--	--	--	--	--	--
Total	1.6	138.1	581.2	756.6	235.0	1,712.5	--	--	--	22.5	99.3	121.8
Larch:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
True firs:												
Sawtimber	2.9	18.8	25.5	17.4	13.0	77.6	--	--	--	11.8	11.0	22.8
Poletimber	--	1.7	20.4	10.6	5.2	37.9	--	--	--	--	--	--
Sapling and seedling	--	3.5	2.9	14.1	13.1	33.6	--	--	--	--	--	--
Nonstocked	--	--	.4	--	--	.9	--	--	--	--	--	--
Total	2.9	24.0	49.7	42.1	31.3	150.0	--	--	--	11.8	11.0	22.8
Fir spruce:												
Sawtimber	.1	20.4	47.8	75.8	1.4	207.	--	--	--	--	--	--
Poletimber	--	1.4	19.2	16.9	6.8	44.3	--	--	--	--	-	--
Sapling and seedling	-	.4	6.0	5.8	2.4	14.6	--	--	--	5.9		5.9
Nonstocked	--	.7	5.7	4.6	3.5	14.5	--	--	--	--	--	--
Total	.1	23.4	128.7	103.1	25.1	280.4	--	--	--	5.9	--	5.9
Other softwoods:												
Sawtimber	--	--	4.6	29.2	21.3	55.1	--	--	--	5.1	--	5.1
Poletimber	-	--	--	3.8	8.8	12.6	--	--	--	--	--	--
Sapling and seedling	--	--	3.3	(1)	9.7	13.0	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	7.9	33.0	39.8	80.7	--	--	--	5.1	--	5.1
Aspen:												
Sawtimber	--	-	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--		--	--	--	--	--	--	5.1	--	5.1
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	6.1	6.1
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	5.1	6.1	11.2
Other hardwoods:[3]												
Sawtimber	--	--	--	--	--	--	--	--	--	5.1	25.7	30.8
Poletimber	--	-	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	-	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	5.1	25.7	30.8
All forest types:												
Sawtimber	15.1	171.7	588.1	772.0	328.5	1,875.4	--	--	--	99.1	338.8	437.9
Poletimber	(1)	50.3	291.6	434.9	202.1	978.9	--	--	--	22.2	156.0	178.2
Sapling and seedling	(1)	26.4	136.2	163.9	115.2	441.7	--	--	--	5.9	71.0	76.9
Nonstocked	.1	6.7	23.0	56.6	42.3	128.7	--	--	--	--	23.7	23.7
Total	15.2	255.1	1,038.9	1,427.4	688.1	3,424.7	--	--	--	127.2	589.5	716.7

[1]Less than 0.05 thousand acres.
[2]Principally whitebark-limber pine.
[3]Principally cottonwood.

Table 17 (con.)

Forest type and stand-size class	Forest industry						Other private					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas fir:												
Sawtimber	--	--	--	--	1.2	1.2	--	--	--	111.5	252.6	364.1
Poletimber	--	--	--	--	1.2	1.2	--	--	--	12.5	135.4	147.9
Sapling and seedling	--	--	--	--	.8	.8	--	--	--	--	28.6	28.6
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	3.2	3.2	--	--	--	124.0	416.6	540.6
Hemlock:												
Sawtimber	0	0	[illegible]	[illegible]	0	[illegible]						
Poletimber	0	0	0	[illegible]	[illegible]	[illegible]						
Sapling and seedling	0	0	0	[illegible]	[illegible]	[illegible]						
Nonstocked	0	0	0	[illegible]	[illegible]	[illegible]						
Total	0	0	0	[illegible]	[illegible]	[illegible]						
Ponderosa pine												
Sawtimber	--	--	--	--	[illegible]	3.8	--	--	--	[illegible]	[illegible]	[illegible]
Poletimber	--	--	--	[illegible]	1.5	1.5	--	--	--	--	129.8	[illegible]
Sapling and seedling	--	[illegible]	[illegible]	--	1.5	1.5	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Nonstocked	--	--	[illegible]	--	1.0	1.0	--	--	[illegible]	--	[illegible]	[illegible]
Total	--	--	--	--	8.4	8.4	--	--	[illegible]	[illegible]	[illegible]	[illegible]
White pine:												
Sawtimber	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Poletimber	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]						
Sapling and seedling	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Nonstocked	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Lodgepole pine												
Sawtimber	--	--	[illegible]	[illegible]	.1	.4	--	--	--	27.5	[illegible]	116.8
Poletimber	--	--	--	.4	.4	.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14.[illegible]
Sapling and seedling	--	--	--	--	.4	.4	[illegible]	[illegible]	[illegible]	--	[illegible]	41.2
Nonstocked	--	--	--	--	--	--	--	[illegible]	[illegible]	[illegible]	--	[illegible]
Total	--	--	--	.4	1.0	1.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Larch:												
Sawtimber	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Poletimber	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Sapling and seedling	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Nonstocked	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
True firs												
Sawtimber	--	[illegible]	[illegible]	[illegible]	.4	.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Poletimber	--	[illegible]	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--
Sapling and seedling	--	--	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	--
Nonstocked	--	--	[illegible]	--	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	--
Total	--	--	--	--	.4	.4	--	[illegible]	--	[illegible]	[illegible]	[illegible]
Fir spruce												
Sawtimber	--	--	[illegible]	--	--	[illegible]	--	--	[illegible]	[illegible]	--	[illegible]
Poletimber	--	--	[illegible]	--	--	--	--	--	[illegible]	[illegible]	--	[illegible]
Sapling and seedling	--	--	--	.4	--	.4	--	[illegible]	[illegible]	.4	[illegible]	.4
Nonstocked	--	--	--	--	--	--	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Total	--	--	--	.4	--	.4	--	--	--	14.4	--	[illegible]
Other softwoods:												
Sawtimber	--	--	--	[illegible]	--	--	--	--	[illegible]	[illegible]	--	[illegible]
Poletimber	--	--	--	--	--	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sapling and seedling	--	[illegible]	--	--	--	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
Nonstocked	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]	--	[illegible]	--	[illegible]	[illegible]
Total	--	--	--	--	--	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Aspen:												
Sawtimber	--	--	[illegible]	--	--	--	[illegible]	--	[illegible]	[illegible]	--	[illegible]
Poletimber	--	--	[illegible]	--	--	--	[illegible]	--	--	[illegible]	--	12.5
Sapling and seedling	--	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	14.9
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	[illegible]	[illegible]	--	[illegible]	--	[illegible]	[illegible]	[illegible]
Other hardwoods:												
Sawtimber	--	--	--	--	[illegible]	--	--	[illegible]	--	[illegible]	[illegible]	[illegible]
Poletimber	--	--	--	--	--	--	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sapling and seedling	--	--	--	--	--	[illegible]	[illegible]	[illegible]	--	--	[illegible]	[illegible]
Nonstocked	--	--	--	--	--	--	--	--	[illegible]	--	[illegible]	[illegible]
Total	--	--	--	--	[illegible]	--	[illegible]	--	[illegible]	[illegible]	[illegible]	[illegible]
All forest types:												
Sawtimber	--	--	--	--	[illegible]	5.8	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
Poletimber	--	--	--	.4	3.1	3.5	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sapling and seedling	--	--	--	.4	3.1	3.5	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nonstocked	--	--	--	--	1.6	1.6	--	--	--	--	57.4	57.4
Total	--	--	--	.8	13.6	14.4	--	--	[illegible]	316.0	1,449.6	1,765.6

Table 18.--AREA OF COMMERCIAL FOREST LAND IN WESTERN SOUTH DAKOTA BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest						Other public					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	-	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Hemlock:												
Sawtimber	-	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	-	-	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	-	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	-	-	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	--	--	--	14.3	537.1	551.4	--	--	--	.9	38.7	39.6
Poletimber	--	--	--	1.8	280.4	282.2	--	--	-	--	30.4	30.4
Sapling and seedling	-	-	--	.8	33.4	34.2	-	--	--	--	1.6	1.6
Nonstocked	--	--	-	--	12.6	12.6	--	--	--	--	--	--
Total	--	--	-	16.9	863.5	880.4	--	--	--	.9	70.7	71.6
White pine:												
Sawtimber	0	-	0	0	0	-	0	0	0	0	0	0
Poletimber	-	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	-	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	-	0	0	0	0	0	0	0	0	0
Total	0	-	-	-	0	0	0	-	0	0	0	0
Lodgepole pine:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Larch:												
Sawtimber	-	0	-	-	0	0	0	0	0	0	0	0
Poletimber	0	0	0	-	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	-	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	-	0	0	0	0	0	0
Total	0	-	-	0	0	0	0	0	0	0	0	0
True fir:												
Sawtimber	0	0	0	0	-	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	-	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	-	0	0	-	0	0	0	0	0	0	0	0
Fir-spruce:												
Sawtimber	--	--	--	18.3	-	18.3	--	--	--	.2	--	.2
Poletimber	--	-	--	--	2.3	2.3	-	--	--	--	--	--
Sapling and seedling	-	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	-	--	--	--	--	--	--	--	--	--	--	--
Total	-	--	-	18.3	2.3	20.6	--	--	--	.2	--	.2
Other softwoods:												
Sawtimber	0	-	-	-	-	0	0	0	0	0	0	0
Poletimber	-	-	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	-	0	-	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	-	0	0	0	0	0	0	0
Total	-	0	-	0	-	0	0	0	0	0	0	0
Aspen:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	-	--	--	-	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	-	--	--	--	--	--	--	--	--	--	--	--
Other hardwoods:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	-	-	-	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	-	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	-	--	--	--	--	--	--
All forest types:												
Sawtimber	--	-	--	32.6	537.1	569.7	--	--	--	1.1	38.7	39.8
Poletimber	--	--	--	1.8	282.7	284.5	--	--	--	--	30.4	30.4
Sapling and seedling	--	--	--	.8	33.4	34.2	--	--	--	--	1.6	1.6
Nonstocked	--	--	--	--	12.6	12.6	--	--	--	--	--	--
Total	--	--	--	35.2	865.8	901.0	--	--	--	1.1	70.7	71.8

Table 18 (con.)

Forest type and stand-size class	Forest industry						Other private					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Hemlock:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	--	--	--	.1	6.2	6.3	--	--	--	.8	89.1	89.9
Poletimber	--	--	--	--	9.9	9.9	--	--	--	--	158.2	158.2
Sapling and seedling	--	--	--	--	.8	.8	--	--	--	--	9.8	9.8
Nonstocked	--	--	--	--	.1	.1	--	--	--	--	3.0	3.0
Total	--	--	--	.1	17.0	17.1	--	--	--	.8	260.1	260.9
White pine:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Lodgepole pine:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Larch:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
True firs:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Fir-spruce:												
Sawtimber	--	--	--	.1	--	.1	--	--	--	1.7	--	1.7
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	.1	--	.1	--	--	--	1.7	--	1.7
Other softwoods:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Aspen:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Other hardwoods:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
All forest types:												
Sawtimber	--	--	--	.2	6.2	6.4	--	--	--	2.5	89.1	92.8
Poletimber	--	--	--	--	9.9	9.9	--	--	--	--	158.2	158.2
Sapling and seedling	--	--	--	--	.8	.8	--	--	--	--	9.8	9.8
Nonstocked	--	--	--	--	.1	.1	--	--	--	--	3.0	3.0
Total	--	--	--	.2	17.0	17.2	--	--	--	2.5	260.1	262.6

Table 19.—AREA OF COMMERCIAL FOREST LAND IN WYOMING BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest						Other public					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir												
Sawtimber	--	--	5.3	35.7	37.0	78.0	--	--	15.5	52.7	31.5	99.7
Poletimber	--	--	--	2.6	12.9	15.5	--	--	--	4.4	13.5	17.9
Sapling and seedling	--	--	--	--	8.3	8.3	--	--	--	--	4.5	4.5
Nonstocked	--	--	--	--	4.6	4.6	--	--	--	--	11.9	11.9
Total	--	--	5.3	38.3	62.8	106.4	--	--	15.5	57.1	61.4	134.0
Hemlock:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	--	--	--	22.8	135.1	157.9	--	--	--	--	147.6	147.6
Poletimber	--	--	(1)	.2	23.3	23.5	--	--	.2	2.2	49.3	51.7
Sapling and seedling	--	--	--	--	1.6	1.6	--	--	--	--	11.6	11.6
Nonstocked	--	--	--	--	1.1	1.1	--	--	--	--	15.3	15.3
Total	--	--	(1)	23.0	161.1	184.1	--	--	.2	2.2	223.8	226.2
White pine:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Lodgepole pine:												
Sawtimber	-	--	6.6	55.1	356.8	418.5	--	--	2.0	14.5	61.7	78.2
Poletimber	--	--	2.2	27.4	431.3	460.9	--	--	.1	1.8	25.1	27.0
Sapling and seedling	--	--	--	--	59.1	59.1	--	--	--	--	5.5	5.5
Nonstocked	--	--	--	--	43.7	43.7	--	--	--	--	8.1	8.1
Total	--	--	8.8	82.5	890.9	982.2	--	--	2.1	16.3	100.4	118.8
Larch:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
True firs:												
Sawtimber	--	--	--	39.1	39.8	78.9	--	--	--	--	--	--
Poletimber	--	--	--	2.6	2.3	4.9	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	6.0	6.0	--	--	--	--	--	--
Nonstocked	--	--	--	--	1.7	1.7	--	--	--	--	--	--
Total	--	--	--	41.7	49.8	91.5	--	--	--	--	--	--
Fir-spruce:												
Sawtimber	--	--	19.6	75.5	156.5	251.6	--	--	3.8	50.9	5.8	60.5
Poletimber	--	--	.2	2.1	45.1	47.4	--	--	9.1	9.1	.7	18.9
Sapling and seedling	--	--	--	--	9.4	9.4	--	--	--	--	3.2	3.2
Nonstocked	--	--	--	--	13.6	13.6	--	--	--	--	9.2	9.2
Total	--	--	19.8	77.6	224.6	322.0	--	--	12.9	60.0	18.9	91.8
Other softwoods:[2]												
Sawtimber	--	--	--	4.5	16.2	20.7	--	--	--	.1	1.8	1.9
Poletimber	--	--	(1)	.2	3.5	3.7	--	--	--	--	1.1	1.1
Sapling and seedling	--	--	--	--	3.0	3.0	--	--	--	--	.3	.3
Nonstocked	--	--	--	--	5.4	5.4	--	--	--	--	.1	.1
Total	--	--	(1)	4.7	28.1	32.8	--	--	--	.1	3.3	3.4
Aspen:												
Sawtimber	--	--	--	--	(1)	(1)	--	--	.2	1.0	19.8	21.0
Poletimber	--	--	--	--	24.8	24.8	--	--	--	--	26.5	26.5
Sapling and seedling	--	--	--	--	28.6	28.6	--	--	--	--	4.7	4.7
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	53.4	53.4	--	--	.2	1.0	51.0	52.2
Other hardwoods:												
Sawtimber	--	--	--	--	(1)	(1)	--	--	--	--	.3	.3
Poletimber	--	--	--	--	.1	.1	--	--	--	--	1.1	1.1
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	.4	.4
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	.1	.1	--	--	--	--	1.8	1.8
All forest types:												
Sawtimber	--	--	31.5	232.7	741.4	1,005.6	--	--	21.5	119.2	268.5	409.2
Poletimber	--	--	2.4	35.1	543.3	580.8	--	--	9.4	17.5	117.3	144.2
Sapling and seedling	--	--	--	--	116.0	116.0	--	--	--	--	30.2	30.2
Nonstocked	--	--	--	--	70.1	70.1	--	--	--	--	44.6	44.6
Total	--	--	33.9	267.8	1,470.8	1,772.5	--	--	30.9	136.7	460.6	628.2

[1]Less than 0.05 thousand acres.
[2]Principally whitebark-limber pine.

Table 19 (con.)

Forest type and stand-size class	Forest industry						Other private					
	Site class											
	165+	125-164	85-124	50-84	20-49	Total	165+	125-164	85-124	50-84	20-49	Total
Douglas fir												
Sawtimber	--	--	.4	1.4	.9	2.7	--	--	7.1	24.2	14.7	46.0
Poletimber	--	--	--	.3	.6	.9	--	--		3.1		12.4
Sapling and seedling	--	--	--	--	.1	.1	--	--	--	--	1.7	1.7
Nonstocked	--	--	--	--	.1	.1	--	--	--	--	1.4	1.4
Total	--	--	.4	1.8	1.7	3.8	--	--	7.1	27.4	17.8	62.3
Hemlock:												
Sawtimber	0				0							
Poletimber	0				0							
Sapling and seedling	0				0							
Nonstocked	0	0	0	0	0	0						
Total	0		0		0							
Ponderosa pine:												
Sawtimber	--	--	--	--	[illegible]	[illegible]	--	--				
Poletimber	--	--	--	.3	[illegible]	[illegible]	--	--		5	108.7	[illegible]
Sapling and seedling	--	--	--	--	[illegible]	[illegible]	--	--	--	--	[illegible]	[illegible]
Nonstocked	--	--	--	--	[illegible]	[illegible]	--	--	--	--	[illegible]	[illegible]
Total	--	--	--	.3	[illegible]	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
White pine:												
Sawtimber												
Poletimber												
Sapling and seedling												
Nonstocked												
Total												
Lodgepole pine:												
Sawtimber	--	--	.1	.7	2.9	3.7	--	--	1.4	[illegible]	[illegible]	[illegible]
Poletimber	--	--	--	.1	1.4	1.5	--	--	--	1.[illegible]	[illegible]	[illegible]
Sapling and seedling	--	--	--	--	[illegible]	[illegible]	--	--	--	--	[illegible]	[illegible]
Nonstocked	--	--	--	--	.1	.1	--	--	--	--	1.4	1.4
Total	--	--	.1	.8	4.[illegible]	[illegible]	--	--	1.[illegible]	[illegible]	[illegible]	[illegible]
Larch:												
Sawtimber												
Poletimber												
Sapling and seedling												
Nonstocked												
Total												
True firs:												
Sawtimber	--	--	--	--	--	--	--	--	--	--		
Poletimber	--	--	--	--	--	--	--	--	--	--		
Sapling and seedling	--	--	--	--	--	--	--	--				
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	
Total	--	--	--	--	--	--	--	--	--		--	
Fir-spruce:												
Sawtimber	--	--	.1	.7	.7	1.5	--	--	1.0	11.4		19.4
Poletimber	--	--	.1	.1	.4	.6	--	--	1.[illegible]	1.[illegible]	4.4	[illegible]
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	.[illegible]	.[illegible]
Nonstocked	--	--	--	--	--	--	--	--	--	--	.[illegible]	.[illegible]
Total	--	--	.2	.8	1.2	2.2	--	--	[illegible]	1[illegible]	[illegible]	[illegible]
Other softwoods:												
Sawtimber	--	--	--	--	.7	.7	--	--	.1	.[illegible]	.[illegible]	.1
Poletimber	--	--	--	--	[illegible]	[illegible]	--	--	--	[illegible]	[illegible]	[illegible]
Sapling and seedling	--	--	--	--	--	--	--	--	--		.[illegible]	.[illegible]
Nonstocked	--	--	--	--	--	--	--	--	--			
Total	--	--	--	--	.9	.9	--	--	.1	--	.[illegible]	[illegible]
Aspen												
Sawtimber	--	--	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Poletimber	--	--	--	--	[illegible]	[illegible]	--	--	--	[illegible]	39.6	[illegible]
Sapling and seedling	--	--	--	--	[illegible]	[illegible]	--	--	--	--	4.7	[illegible]
Nonstocked	--	--	--	--	--	--	--	--	--	--	[illegible]	[illegible]
Total	--	--	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
Other hardwoods:												
Sawtimber	--	--	--	--	--	--	--	--	--	--		[illegible]
Poletimber	--	--	--	--	.6	.6	--	--	--	[illegible]	[illegible]	[illegible]
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	[illegible]	[illegible]
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	.6	.6	--	--	--	--	[illegible]	[illegible]
All forest types:												
Sawtimber	--	--	.6	3.0	34.6	38.2	--	--	9.9	48.1	479.7	537.7
Poletimber	--	--	.1	.7	13.1	13.9	--	--	[illegible]	11.[illegible]	209.3	[illegible]
Sapling and seedling	--	--	--	--	1.4	1.4	--	--	--	--	[illegible]	[illegible]
Nonstocked	--	--	--	--	.8	.8	--	--	--	--	13.1	13.1
Total	--	--	.7	3.7	49.9	54.3	--	--	12.1	[illegible]	726.7	[illegible]

Table 20.—AREA OF COMMERCIAL FOREST LAND IN ARIZONA BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand size class	National Forest: Site class: 165+	120-164	85-119	50-84	20-49	Total	Other public: Site class: 165+	120-164	85-119	50-84	20-49	Total
	Thousand acres											
[illegible]												
Sawtimber	--	--	1[illegible]	[illegible]	44.0	134.5	--	--	3.4	1.7	--	5.1
[illegible]	-	-	1.3	2.3	-	3.6	--	--	--	--	--	--
Sapling and seedling	-	--	-	--	.3	.3	-	--	--	--	--	--
Nonstocked	--	--	--	--	3.7	3.7	--	--	--	--	--	--
Total	--	--	1[illegible]	78.9	48.0	147.1	--	--	3.4	1.7	--	5.1
[illegible]												
[illegible]												
[illegible]												
Poletimber						0	0	0	0	0	0	0
[illegible]						0	0	0	0	0	0	0
Nonstocked						0	0	0	0	0	0	0
Total						0	0	0	0	0	0	0
Ponderosa pine:												
[illegible]	-	[illegible]	1[illegible]	459.9	1,172.5	1,652.5	--	--	98.2	458.5	491.3	1,048.0
Poletimber	--	[illegible]	-	13.9	124.5	138.4	--	--	--	1.8	--	1.8
Sapling and seedling	--	-	-	5.4	116.7	122.1	--	--	--	2.9	.7	3.6
Nonstocked	--	--	--	18.0	107.6	125.6	--	--	--	--	3.9	3.9
[illegible]	-	-	[illegible]	497.2	1,521.3	2,038.6	--	--	98.2	463.2	495.9	1,057.3
[illegible]												
[illegible]												
[illegible]												
Poletimber												
[illegible]												
Nonstocked												
Total												
[illegible]												
Sawtimber												
Poletimber												
Sapling and seedling												
[illegible]												
Total												
[illegible]												
Sawtimber												
Poletimber												
Sapling and seedling												
[illegible]												
Total												
[illegible]												
[illegible]	--		11.0	36.1	[illegible]	48[illegible]		--	--	--	--	--
Poletimber	-			[illegible]	--	--	-	--	--	--	--	--
Sapling and seedling	-	--	-	--	-	--	--	-	--	--	--	--
Nonstocked	--	-	--		--	--	--	--	--	--	--	--
[illegible]	--	-	[illegible]	[illegible].1	1.[illegible]	48.[illegible]	--	--	--	--	--	--
[illegible]												
Sawtimber	-		1[illegible]		-	14.[illegible]	--	--	--	46.9	46.9	93.8
[illegible]	-		-	-			-	--	--	--	--	--
[illegible]	-	--			-	-	--	--	--	--	--	--
Nonstocked	-	-	-		--	.4	--	--	--	--	--	--
[illegible]	-	--	1[illegible]		[illegible]	14.[illegible]	--	--	--	46.9	46.9	93.8
[illegible]												
Sawtimber	-	-	--	-		--	--	--	--	--	--	--
[illegible]	--	-	-	--	-	--	--	--	--	--	--	--
Sapling and seedling	-	--	--	-	-	--	--	--	--	--	--	--
Nonstocked	--	-	--		-	--	--	--	--	--	--	--
[illegible]	-	--	--	--	--	--	--	--	--	--	--	--
[illegible]												
[illegible]	--	--	5.7	17.3	4.[illegible]	27.6	--	--	--	--	--	--
Poletimber	-	-	1.3	[illegible]	2.9	4.7	--	--	--	--	19.6	19.6
Sapling and seedling	--	--	--	.4	10.5	13.9	--	--	--	--	--	--
Nonstocked	--	-	-	--	--	--	--	--	--	--	--	--
Total	--	-	[illegible]	21.[illegible]	18.[illegible]	46.[illegible]	--	--	--	--	19.6	19.6
Other hardwoods:												
[illegible]	--	--	--	-	--	--	--	--	--	--	--	--
Poletimber	--	-	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	-	-	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
All forest types:												
Sawtimber	--	[illegible]	58.6	590.8	1,223.1	1,882.0	--	--	101.6	507.1	538.2	1,146.9
Poletimber	--	--	2.6	16.7	127.4	146.7	--	--	--	1.8	19.6	21.4
Sapling and seedling	--	--	--	8.8	127.5	136.3	--	--	--	2.9	.7	3.6
Nonstocked	--	--	--	18.0	111.7	129.7	--	--	--	--	3.9	3.9
Total	--	9.5	61.2	634.3	1,589.7	2,294.7	--	--	101.6	511.8	562.4	1,175.8

Table 20 (con.)

Forest type and stand-size class	Forest industry											
	Site class					Total						
	165+	120-164	85-119	50-84	20-49							
Douglas-fir:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	-	--	--	-	--	-	-
Sapling and seedling	--	--	--	--	--	--	--	-	-	--	-	-
Nonstocked	--	--	--	-	--	-	--	--	--	--	--	--
Total	--	--	--	--	--	-	--	-	-	--	-	-
Hemlock:												
Sawtimber	0	--	0	--	--	-	--	--	--	--	--	--
Poletimber	-	-	-	-	-	-	-	-	-	-	-	-
Sapling and seedling	0	-	0	-	-	-	-	-	-	-	-	-
Nonstocked	0	0	0	-	-	0	-	-	-	-	-	-
Total	0	0	0	0	-	0	-	-	-	-	-	-
Ponderosa pine:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	.1	--	6.0	7.4
Sapling and seedling	--	--	--	--	--	--	--	-	-	--	15.0	.4
Nonstocked	--	--	--	--	--	--	--	--	-	--	-	-
Total	--	--	--	--	--	--	--	--	1.4	.1	21.0	7.8
White pine:												
Sawtimber	0	-	-	-	-	-	-	-	-	-	-	-
Poletimber	0	0	-	-	-	-	-	-	-	-	-	-
Sapling and seedling	0	0	0	-	-	0	-	-	-	-	-	-
Nonstocked	0	0	-	-	-	0	-	-	-	-	-	-
Total	0	0	0	0	0	0	-	0	-	-	-	-
Lodgepole pine:												
Sawtimber	0	-	-	-	-	-	-	-	-	-	-	-
Poletimber	-	-	-	-	-	-	-	-	-	-	-	-
Sapling and seedling	0	0	-	-	-	-	-	-	-	-	-	-
Nonstocked	0	0	-	-	-	-	-	-	-	-	-	-
Total	0	0	0	0	0	0	-	-	-	-	-	-
Larch:												
Sawtimber	0	-	-	0	-	-	-	-	-	-	-	-
Poletimber	-	-	-	-	-	-	-	-	-	-	-	-
Sapling and seedling	0	0	-	0	-	-	-	-	-	-	-	-
Nonstocked	0	0	-	0	-	-	-	-	-	-	-	-
Total	0	0	0	0	0	-	-	-	-	-	-	-
True firs:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	-	--	--	--	--	-	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Fir-spruce:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	-	-	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	-	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Other softwoods:												
Sawtimber	--	--	--	--	--	-	--	--	--	--	-	-
Poletimber	--	--	--	--	--	--	--	--	--	-	-	-
Sapling and seedling	--	--	--	--	--	--	--	--	--	-	--	--
Nonstocked	--	--	--	--	--	--	--	-	--	-	-	-
Total	--	--	--	--	--	--	-	--	-	-	-	-
Aspen:												
Sawtimber	--	--	--	--	--	-	--	--	.1	-	-	.1
Poletimber	--	--	--	--	-	--	--	-	-	--	-	-
Sapling and seedling	--	--	--	--	--	-	--	-	-	.1	.4	2.2
Nonstocked	--	--	--	--	--	--	-	--	--	-	-	-
Total	--	--	--	--	--	--	--	--	1.4	.1	.4	2.3
Other hardwoods:												
Sawtimber	--	--	--	--	--	-	--	-	--	--	-	-
Poletimber	--	--	--	--	--	--	--	--	--	--	-	-
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	-	-
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
All forest types:												
Sawtimber	--	--	--	--	--	--	--	--	1.2	.1	.1	1.4
Poletimber	--	--	--	--	--	--	--	--	1.4	--	12.6	14.0
Sapling and seedling	--	--	--	--	--	--	--	--	--	1.6	15.4	17.1
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	2.6	1.7	28.1	32.5

Table 21.--AREA OF COMMERCIAL FOREST LAND IN COLORADO BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest						Other public					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir												
Sawtimber	--	--	--	28.6	199.2	227.8	--	--	--	29.5	98.0	127.5
Poletimber	--	--	--	13.3	47.3	60.6	--	--	2.5	--	54.5	57.0
Sapling and seedling	--	--	--	4.5	1.3	5.8	--	--	--	--	.4	.4
Nonstocked	--	--	--	2.7	31.9	34.6	--	--	--	--	2.2	2.2
Total	--	--	--	49.1	279.7	328.8	--	--	2.5	29.5	155.1	187.1
Hemlock:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	--	--	--	16.4	306.3	322.7	--	--	--	4.3	164.0	168.3
Poletimber	--	--	--	--	33.4	33.4	--	--	--	--	39.4	39.4
Sapling and seedling	--	--	--	--	15.4	15.4	--	--	--	-	.1	.1
Nonstocked	--	--	--	4.1	174.0	178.1	--	--	--	--	.3	.3
Total	--	--	--	20.5	529.1	549.6	--	--	--	4.3	203.8	208.1
White pine:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Lodgepole pine:												
Sawtimber	--	--	12.1	88.7	261.3	359.1	--	--	--	--	26.3	26.3
Poletimber	--	--	--	26.4	210.8	237.2	--	--	--	.8	69.4	70.2
Sapling and seedling	--	--	--	3.3	53.8	57.1	--	--	--	--	4.9	4.9
Nonstocked	--	--	--	1.7	7.9	9.6	--	--	--	--	.5	.5
Total	--	--	12.1	117.1	533.8	663.0	--	--	--	.8	101.1	101.9
Larch:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
True fir:												
Sawtimber	--	--	64.4	91.4	723.7	1,107.5	--	--	--	--	1.4	1.4
Poletimber	--	--	--	26.3	65.0	91.3	--	--	--	--	1.1	1.1
Sapling and seedling	--	--	--	44.8	71.8	116.6	--	--	--	--	--	--
Nonstocked	--	--	--	78.5	112.9	191.4	--	--	--	--	--	--
Total	--	--	64.4	460.0	973.4	1,506.8	--	--	--	--	2.5	2.5
Fir-spruce:												
Sawtimber	--	--	66.1	111.9	253.9	432.9	--	--	8.5	14.5	32.9	55.9
Poletimber	--	--	10.5	32.6	74.0	117.1	--	--	.5	1.7	3.9	6.1
Sapling and seedling	--	--	--	--	10.0	10.0	--	--	--	--	.4	.4
Nonstocked	--	--	--	--	180.8	180.8	--	--	--	--	3.6	3.6
Total	--	--	76.6	144.5	518.7	740.8	--	--	9.0	16.2	40.8	66.0
Other softwoods:												
Sawtimber	--	--	--	--	13.0	13.0	--	--	--	.7	4.5	5.2
Poletimber	--	--	--	--	--	--	--	--	--	.1	2.3	2.4
Sapling and seedling	--	--	--	--	.4	.4	--	--	--	--	.2	.2
Nonstocked	--	--	--	--	1.5	1.5	--	--	--	--	--	--
Total	--	--	--	--	14.9	14.9	--	--	--	.8	7.0	7.8
Aspen:												
Sawtimber	12.5	5.5	20.6	113.9	247.9	400.4	--	1.8	3.5	1.6	17.3	24.2
Poletimber	17.7	25.9	125.3	142.8	291.2	602.9	--	--	--	--	122.4	122.4
Sapling and seedling	--	--	6.9	58.5	137.6	203.0	--	--	--	--	14.0	14.0
Nonstocked	--	2.4	25.5	28.5	99.9	156.3	--	--	--	--	.2	.2
Total	30.2	33.8	178.3	343.7	776.6	1,362.6	--	1.8	3.5	1.6	153.9	160.8
Other hardwoods:												
Sawtimber	--	--	--	--	.1	.1	--	--	--	--	19.8	19.8
Poletimber	--	--	--	--	--	--	--	--	--	--	.3	.3
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	.2	.2
Total	--	--	--	--	.1	.1	--	--	--	--	20.3	20.3
All forest types:												
Sawtimber	12.5	5.5	163.2	676.9	2,005.4	2,863.5	--	1.8	12.0	50.6	364.2	428.6
Poletimber	17.7	25.9	135.8	241.4	721.7	1,142.5	--	--	3.0	2.6	293.3	298.9
Sapling and seedling	--	--	6.9	111.1	290.3	408.3	--	--	--	--	20.0	20.0
Nonstocked	--	2.4	25.5	115.5	608.9	752.3	--	--	--	--	7.0	7.0
Total	30.2	33.8	331.4	1,144.9	3,626.3	5,166.6	--	1.8	15.0	53.2	684.5	754.5

[1]Principally limber pine.
[2]Principally cottonwood.

(Table 21 cont.)

Forest type and stand-size class	Forest industry						Other private				
	10-19	20-49	50-69	70-89	90+	Total	10-19	20-49	50-69	70-89	90+
Douglas-fir											
Sawtimber	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	4	--	118.0
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	2.0
Nonstocked	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	.1	--	--
Hemlock											
Sawtimber											
Poletimber											
Sapling and seedling											
Nonstocked											
Total											
Ponderosa pine:											
Sawtimber	--	--	--	--		--			--		.1
Poletimber	--	--	--	--		--	--		--	--	
Sapling and seedling	-	--	--	--		--	--		-	--	
Nonstocked	--	--	--	--	--	--	--	--	-	-	
Total	-	--	--	-	--	--	--				
White pine											
Sawtimber											
Poletimber											
Sapling and seedling											
Nonstocked											
Total											
Lodgepole pine											
Sawtimber	--	--	--	--				--	-	--	
Poletimber	--	--	--			10.0		--	-	--	44.1
Sapling and seedling	--	--	--	--	.4	.4		--	--	--	
Nonstocked	--	--	--	--	--	--	--	--	--	--	.4
Total	--	-	--	.4	1..	1...			-		
Larch:											
Sawtimber											
Poletimber											
Sapling and seedling											
Nonstocked											
Total											
True fir:											
Sawtimber	--	--	--					--	--		
Poletimber	--	--	--			--	--	--			1
Sapling and seedling	--	--	--	--		--	--	-	-		-
Nonstocked	--	--	--	--	--	--	--			--	--
Total	--	-	--	--	--	-		--	--	-	
Fir-spruce											
Sawtimber	-	--			1.		--				
Poletimber	--		--	.1			-		4.4		
Sapling and seedling	--	-	--	--	--	-	--			-	
Nonstocked	--	--	--	--	--	--	--			--	
Total	--	--		.7			--		4..		
Other softwoods [1]											
Sawtimber	-	--		--	--	--	--	--	--	1.9	
Poletimber	--	--		--	--	--	--	-	-	1.0	
Sapling and seedling	--	--		--	--	--	--	-			
Nonstocked	--	--	--	--	--	-	-	--	--	--	
Total	-	--	-	--	--	--	--				
Aspen:											
Sawtimber	--	--	-	-		1	-				45.0
Poletimber	--	--	--	--			-	--			
Sapling and seedling	--	-	--	--			--	-		-	
Nonstocked	--	--	--	--	--	--	--		--	-	
Total	--	--	--	--			--	4		1.	
Other hardwoods: [2]											
Sawtimber	--	--	--	-	--		--	--			
Poletimber	--	--	--	--	-	-	-		--		
Sapling and seedling	--	--	--	-	--	--	-	--	-	--	
Nonstocked	--	--	--	--	--	--	--	--		--	
Total	--	--	--	--	--	--	-	-	--	--	
All forest types:											
Sawtimber	--	--	.3	.6	3.1	4.0	--	4.6	4..	..	..,070.2
Poletimber	--	--	--	.2	10.1	1..3	--	--	...	3	..,404.4
Sapling and seedling	--	--	--	--	.4	.4	--	--		-	135.9
Nonstocked	--	--	--	--	--	--	--	--	--	--	264.2
Total	--	--	.3	.8	13.6	14.7	--	4.6	67.7	1...	..,-34 .

| Forest type and stand-size class | Other private | | | | | | | | | | |

Table 22.--AREA OF COMMERCIAL FOREST LAND IN NEVADA BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest						Other public					
	Site class					Total	Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	2.9	2.9	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	2.9	2.9	--	--	--	--	--	--
Hemlock:												
Sawtimber	--	--	--	--	1.6	1.6	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	1.6	1.6	--	--	--	--	--	--
Ponderosa pine:												
Sawtimber	--	--	.8	3.5	11.1	15.4	--	--	--	1.0	1.7	2.7
Poletimber	--	--	--	--	.3	.3	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	.1	.1
Nonstocked	--	.2	.2	1.3	2.7	4.4	--	--	--	--	.1	.1
Total	--	.2	1.0	4.8	14.1	20.1	--	--	--	1.0	1.9	2.9
White pine:												
Sawtimber	--	--	--	.6	--	.6	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	.6	--	.6	--	--	--	--	--	--
Lodgepole pine:												
Sawtimber	--	--	--	--	1.1	1.1	--	--	--	.1	.1	.2
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	1.1	1.1	--	--	--	.1	.1	.2
Larch:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
True firs:												
Sawtimber	--	.1	.8	.8	3.7	5.4	--	.1	.4	.4	.6	1.5
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	.2	.2	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	.1	.8	.8	4.2	5.9	--	.1	.4	.4	.6	1.5
Fir spruce:												
Sawtimber	--	--	--	--	10.2	10.2	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	10.2	10.2	--	--	--	--	--	--
Other softwoods:[1]												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	4.8	4.8	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	4.8	4.8	--	--	--	--	--	--
Aspen:												
Sawtimber	--	--	--	--	6.5	6.5	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	6.5	6.5	--	--	--	--	--	--
Other hardwoods:[2]												
Sawtimber	--	--	--	--	.7	.7	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	.7	.7	--	--	--	--	--	--
All forest types:												
Sawtimber	--	.1	1.6	4.9	34.9	41.5	--	.1	.4	1.5	2.4	4.4
Poletimber	--	--	--	--	3.2	3.2	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	5.3	5.3	--	--	--	--	.1	.1
Nonstocked	--	.2	.2	1.3	2.7	4.4	--	--	--	--	.1	.1
Total	--	.3	1.8	6.2	46.1	54.4	--	.1	.4	1.5	2.6	4.6

[1] Principally whitebark-limber pine
[2] Principally cottonwood.

Table 22 (con.)

Forest type and stand-size class	Forest industry						Other private					
	Site class					Total	Site class					
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
Douglas-fir:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Hemlock:												
Sawtimber	--	--	--	--	.1	.1	--	--	--	--	.7	.7
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	.1	.1	--	--	--	--	.7	.7
Ponderosa pine:												
Sawtimber	--	--	.1	1.4	2.6	4.1	--	--	.9	10.4	15.0	26.3
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	.3	.3	--	--	--	--	1.4	1.4
Nonstocked	--	--	--	--	.1	.1	--	--	--	--	.7	.7
Total	--	--	.1	1.4	2.9	4.4	--	--	.9	10.4	18.0	29.3
White pine:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Lodgepole pine:												
Sawtimber	--	--	--	.1	.5	.6	--	--	--	.7	3.2	3.9
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	.1	.5	.6	--	--	--	.7	3.2	3.9
Larch:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
True firs:												
Sawtimber	--	.3	.7	.9	.9	2.8	--	2.2	8.0	6.9	6.3	23.4
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	.4	.4	--	--	--	--	1.4	1.4
Total	--	.3	.7	.9	1.3	3.2	--	2.2	8.0	6.9	7.7	24.8
Fir-spruce:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Other softwoods:[1]												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Aspen:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
Other hardwoods:[2]												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
All Forest types:												
Sawtimber	--	.3	.8	2.4	4.0	7.5	--	2.2	9.9	18.0	26.2	56.8
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	.3	.3	--	--	--	--	1.4	1.4
Nonstocked	--	--	--	--	.5	.5	--	--	--	--	2.1	2.1
Total	--	.3	.8	2.4	4.8	8.3	--	2.2	9.9	18.0	30.2	60.3

Table 24 (cont.)

Forest type and stand-size class	Forest industry: Site class: 1&2	3	4	5&6	7&8	Total	Nonforest: 1&2	3	4	5&6	7&8	Total
Douglas-fir:												
Sawtimber	--	--	--	8.3	28.0	36.3					234.6	
Poletimber	--	--	--	--	3.7	3.7					46.3	
Sapling and seedling	--	--	--	--	--	--						
Nonstocked	--	--	--	--	--	--				--		
Total	--	--	--	8.3	31.7	40.0						
Hemlock:												
Sawtimber												
Poletimber												
Sapling and seedling												
Nonstocked												
Total												
Ponderosa pine:												
Sawtimber	--	--	--	13.8	52.2	66.1						880.3
Poletimber	--	--	--	--	2.4	2.4					30.9	30.9
Sapling and seedling	--	3.1	--	3.1	3.1	9.4	--	41.1	--	41.1	41.2	123.4
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	3.2	--	24.0	61.7	88.9	--	41.1	54.6	575.0	1,119.3	1,790.0
White pine:												
Sawtimber												
Poletimber												
Sapling and seedling												
Nonstocked												
Total												
Lodgepole pine:												
Sawtimber												
Poletimber												
Sapling and seedling												
Nonstocked												
Total												
Larch:												
Sawtimber												
Poletimber												
Sapling and seedling												
Nonstocked												
Total												
True firs:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	
Poletimber	--	--	--	-	--	--	--	--	--	--		-
Sapling and seedling	--	--	--	--	--	--	--	--	-	-		-
Nonstocked	--	--	--	--	-	-	--	--	--	--	--	--
Total	-	--	--	-	--	--	--	--	--	--		
Fir spruce:												
Sawtimber	--	--	--	14.7	--	14.7	-	--	-	170.4		185.3
Poletimber	--	--	--	--	--	--	-	--	--	--		
Sapling and seedling	--	.9	--	.9	.9	2.4	--	16.5	-	10.3	2.1	30.9
Nonstocked	--	--	--	--	--	--	--	--	-	--	--	--
Total	--	.9	--	15.6	.9	17.1	-	16.5	--	180.7	2.1	216.2
Other softwoods:												
Sawtimber	--	--	.1	.7	1.6	2.4	-	-			1.4	1.4
Poletimber	--	--	--	--	--	--	--	--	--		-	
Sapling and seedling	--	--	--	--	--	--	--	-			--	--
Nonstocked	--	--	--	--	--	--	-	--				
Total	--	--	.1	.7	1.6	2.4	-	--	1.4		1.4	2.8
Aspen:												
Sawtimber	--	-	1.7	2.8		4.5	-		3.0	53.6	-	107.2
Poletimber	--	--		1.2	1.2	2.4	--	--	--	23.0	22.9	4.7
Sapling and seedling	--	.1	--	.1	.1	.3	--	1	-	.1	5.1	15.3
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	.1	1.7	4.3	1.4	7.2	--	5.1	53.0	81.7	28.1	168.4
Other hardwoods:												
Sawtimber	--	--	--	--	--	--	--	-	--	-	-	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--		--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
All forest types:												
Sawtimber	--	--	2.8	39.0	77.4	119.2	--	--	54.6	517.9	956.5	1,643.5
Poletimber	--	--	--	1.2	7.3	8.5	--	--	--	23.0	100.1	123.1
Sapling and seedling	--	3.1	--	3.2	3.1	9.4	--	41.1	--	41.1	41.2	123.4
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	3.1	2.8	43.4	87.8	137.1	--	41.1	54.6	575.0	1,119.3	1,790.0

Table 24.—AREA OF COMMERCIAL FOREST LAND IN UTAH BY OWNER GROUP, FOREST TYPE, STAND-SIZE CLASS, AND SITE CLASS, 1970

Forest type and stand-size class	National Forest Site class					Total	Other public Site class					Total
	165+	120-164	85-119	50-84	20-49		165+	120-164	85-119	50-84	20-49	
	Thousand acres											
Douglas-fir:												
Sawtimber	9.7	1.1	1.2	50.3	180.6	242.9	--	--	27.4	27.4	82.0	136.8
Poletimber	--	--	--	2.7	25.5	28.2	--	--	--	--	11.9	11.9
Sapling and seedling	--	--	--	--	2.6	2.6	--	--	--	--	17.9	17.9
Nonstocked	--	--	--	--	2.7	2.7	--	--	--	--	--	--
Total	9.7	1.1	1.2	53.0	211.4	276.4	--	--	27.4	27.4	111.8	166.6
Hemlock:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	--	--	--	1.4	288.5	289.9	--	--	2.8	4.4	36.6	43.8
Poletimber	--	--	--	--	13.0	13.0	--	--	--	--	3.9	3.9
Sapling and seedling	--	--	--	--	23.8	23.8	--	--	--	--	4.2	4.2
Nonstocked	--	--	--	--	16.0	16.0	--	--	--	--	4.2	4.2
Total	--	--	--	1.4	341.3	342.7	--	--	2.8	4.4	48.9	56.1
White pine:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Lodgepole pine:												
Sawtimber	--	--	--	11.1	200.2	211.3	--	--	2.2	3.5	29.3	35.0
Poletimber	--	--	--	5.2	207.2	212.4	--	--	--	--	6.1	6.1
Sapling and seedling	--	--	--	--	29.5	29.5	--	--	--	--	4.8	4.8
Nonstocked	--	--	--	--	4.9	4.9	--	--	--	--	.3	.3
Total	--	--	--	16.3	441.8	458.1	--	--	2.2	3.5	40.5	46.2
Larch:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
True fir:												
Sawtimber	--	--	[illegible]	[illegible]	192.1	258.9	--	--	1.4	17.9	33.4	52.7
Poletimber	--	--	--	[illegible]	42.1	49.4	--	--	--	--	4.5	4.5
Sapling and seedling	--	--	--	4.7	1.8	[illegible]	--	--	--	--	6.8	6.8
Nonstocked	--	--	--	--	.6	.6	--	--	--	--	--	--
Total	--	--	3.0	75.8	236.6	315.4	--	--	1.4	17.9	44.7	64.0
Fir-spruce:												
Sawtimber	--	--	5.0	90.8	306.4	402.2	--	--	2.0	3.2	26.4	31.6
Poletimber	--	--	--	--	8.8	8.8	--	--	--	--	2.7	2.7
Sapling and seedling	--	--	--	--	13.6	13.6	--	--	--	--	4.1	4.1
Nonstocked	--	--	--	--	1.6	1.6	--	--	--	--	--	--
Total	--	--	5.0	90.8	330.4	426.2	--	--	2.0	3.2	33.2	38.4
Other softwoods:												
Sawtimber	--	--	--	--	12.9	12.9	--	--	.7	1.0	8.8	10.5
Poletimber	--	--	--	--	.7	.7	--	--	--	--	.9	.9
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	1.4	1.4
Nonstocked	--	--	--	--	.3	.3	--	--	--	--	--	--
Total	--	--	--	--	13.9	13.9	--	--	.7	1.0	11.1	12.8
Aspen:												
Sawtimber	--	--	--	9.2	140.8	150.0	--	--	--	--	67.4	67.4
Poletimber	--	--	--	12.1	361.9	374.0	--	--	--	--	72.7	72.7
Sapling and seedling	--	--	--	--	49.8	49.8	--	--	--	--	20.8	20.8
Nonstocked	--	--	--	--	1.3	1.3	--	--	--	--	5.2	5.2
Total	--	--	--	21.3	553.8	575.1	--	--	--	--	166.1	166.1
Other hardwoods:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
All forest types:												
Sawtimber	9.7	1.1	9.2	226.6	1,321.5	1,568.1	--	--	36.5	57.4	283.9	377.8
Poletimber	--	--	--	27.3	659.2	686.5	--	--	--	--	102.7	102.7
Sapling and seedling	--	--	--	4.7	121.1	125.8	--	--	--	--	60.0	60.0
Nonstocked	--	--	--	--	27.4	27.4	--	--	--	--	9.7	9.7
Total	9.7	1.1	9.2	258.6	2,129.2	2,407.8	--	--	36.5	57.4	456.3	550.2

[1]Principally limber pine.

Table 24 (cont.)

Forest type and stand-size class	Forest industry Site class 165+	120-164	85-119	50-84	20-49	Total	other private Site class 165+	120-164	85-119	50-84	20-49	Total
	Thousand cubic feet											
Douglas fir:												
Sawtimber	--	--	--	--	--	--	--	--	22.6	23.9	67.4	113.9
Poletimber	--	--	--	--	--	--	--	--	--	--	9.8	9.8
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	14.8	14.8
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	22.6	23.9	92.0	138.5
Hemlock:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Ponderosa pine:												
Sawtimber	--	--	--	--	--	--	--	--	1.7	2.6	21.8	26.1
Poletimber	--	--	--	--	--	--	--	--	--	--	2.3	2.3
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	3.4	3.4
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	1.7	2.6	27.5	31.8
White pine:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Lodgepole pine:												
Sawtimber	--	--	--	--	--	--	--	--	1.7	2.6	21.8	26.1
Poletimber	--	--	--	--	--	--	--	--	--	--	2.3	2.3
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	3.4	3.4
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	1.7	2.6	27.5	31.8
Larch:												
Sawtimber	0	0	0	0	0	0	0	0	0	0	0	0
Poletimber	0	0	0	0	0	0	0	0	0	0	0	0
Sapling and seedling	0	0	0	0	0	0	0	0	0	0	0	0
Nonstocked	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
True firs:												
Sawtimber	--	--	--	--	--	--	--	--	1.1	14.8	27.6	43.5
Poletimber	--	--	--	--	--	--	--	--	--	--	3.8	3.8
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	5.7	5.7
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	1.1	14.8	37.1	53.0
Fir-spruce:												
Sawtimber	--	--	--	--	--	--	--	--	1.7	2.6	21.8	26.1
Poletimber	--	--	--	--	--	--	--	--	--	--	2.3	2.3
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	3.4	3.4
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	1.7	2.6	27.5	31.8
Other softwoods:[1]												
Sawtimber	--	--	--	--	--	--	--	--	.6	.9	7.2	8.7
Poletimber	--	--	--	--	--	--	--	--	--	--	.8	.8
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	1.1	1.1
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	.6	.9	9.1	10.6
Aspen:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	148.0	148.0
Poletimber	--	--	--	--	--	--	--	--	--	--	159.2	159.2
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	45.5	45.5
Nonstocked	--	--	--	--	--	--	--	--	--	--	11.4	11.4
Total	--	--	--	--	--	--	--	--	--	--	364.1	364.1
Other hardwoods:												
Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
All forest types:												
Sawtimber	--	--	--	--	--	--	--	--	29.4	46.1	316.1	391.6
Poletimber	--	--	--	--	--	--	--	--	--	--	180.5	180.5
Sapling and seedling	--	--	--	--	--	--	--	--	--	--	77.3	77.3
Nonstocked	--	--	--	--	--	--	--	--	--	--	11.4	11.4
Total	--	--	--	--	--	--	--	--	29.4	46.1	585.3	660.8

Table 25.--NET VOLUME OF GROWING STOCK AND SAWTIMBER ON COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY SOFTWOODS AND HARDWOODS AND OWNER GROUP, 1970

State	All owner groups	National Forest	Other public	Forest industry	Other private	All owner groups	National Forest	Other public	Forest industry	Other private
	Million cubic feet growing stock					*Million board feet sawtimber*[1]				
North. Rocky Mountain States:										
North Idaho:										
Softwoods	17,845.4	9,294.5	2,433.7	2,635.7	3,481.5	80,364.7	43,823.7	10,559.5	11,970.7	14,010.8
Hardwoods	113.2	36.2	5.0	15.6	56.4	276.5	114.5	--	42.1	119.9
All species	17,958.6	9,330.7	2,438.7	2,651.3	3,537.9	80,641.2	43,938.2	10,559.5	12,012.8	14,130.7
South Idaho:										
Softwoods	11,412.3	9,890.6	833.6	276.9	411.2	50,621.6	43,542.6	3,865.7	1,319.7	1,893.6
Hardwoods	126.4	48.2	43.7	12.1	22.4	403.1	102.1	164.5	55.0	81.5
All species	11,538.7	9,938.8	877.3	289.0	433.6	51,024.7	43,644.7	4,030.2	1,374.7	1,975.1
Western Montana:										
Softwoods	19,372.3	13,012.4	1,619.7	2,087.7	2,652.5	72,376.8	46,287.8	6,355.9	9,500.2	10,232.9
Hardwoods	77.7	28.3	7.6	6.1	35.7	230.5	72.5	29.6	20.8	107.6
All species	19,450.0	13,040.7	1,627.3	2,093.8	2,688.2	72,607.3	46,360.3	6,385.5	9,521.0	10,340.5
Eastern Montana:										
Softwoods	9,004.0	5,762.9	923.7	9.3	2,308.1	28,548.8	18,460.8	2,863.1	26.2	7,198.7
Hardwoods	196.0	4.8	54.1	--	137.1	862.1	9.1	241.0	--	612.0
All species	9,200.0	5,767.7	977.8	9.3	2,445.2	29,410.9	18,469.9	3,104.1	26.2	7,810.7
Western S. Dakota:										
Softwoods	1,001.1	753.7	55.4	11.8	180.2	3,434.7	2,624.7	194.7	38.4	576.9
Hardwoods	6.2	--	1.0	.3	4.9	9.0	--	1.4	.4	7.2
All species	1,007.3	753.7	56.4	12.1	185.1	3,443.7	2,624.7	196.1	38.8	584.1
Wyoming:										
Softwoods	4,471.2	3,077.0	576.4	60.7	757.1	16,040.4	11,325.4	1,951.7	220.0	2,543.3
Hardwoods	201.9	51.2	57.8	3.4	89.5	324.6	33.6	110.9	2.7	177.4
All species	4,673.1	3,128.2	634.2	64.1	846.6	16,365.0	11,359.0	2,062.6	222.7	2,720.7
Total Northern Rocky Mountain States:										
Softwoods	63,106.3	41,791.1	6,442.5	5,082.1	9,790.6	251,387.0	166,065.0	25,790.6	23,075.2	36,456.2
Hardwoods	721.4	168.7	169.2	37.5	346.0	2,105.8	331.8	547.4	121.0	1,105.6
All species	63,827.7	41,959.8	6,611.7	5,119.6	10,136.6	253,492.8	166,396.8	26,338.0	23,196.2	37,561.8
South. Rocky Mountain States:										
Arizona:										
Softwoods	4,583.8	3,028.9	1,449.3	--	105.6	20,902.7	13,816.7	6,727.2	--	358.8
Hardwoods	226.1	139.2	47.8	--	39.1	678.7	454.7	99.7	--	124.3
All species	4,809.9	3,168.1	1,497.1	-	144.7	21,581.4	14,271.4	6,826.9	--	483.1
Colorado:										
Softwoods	10,360.0	7,222.2	71[illegible]	21.4	2,403.6	42,633.6	31,434.6	2,567.7	74.5	8,556.8
Hardwoods	1,907.1	1,132.2	149.9	.4	624.6	3,442.5	2,206.5	280.2	.8	955.0
All species	12,267.1	8,354.4	862.7	21.8	3,028.2	46,076.1	33,641.1	2,847.9	75.3	9,511.8
Nevada:										
Softwood	237.4	74.0	9.0	15.5	138.9	1,319.5	373.5	51.1	86.3	808.6
Hardwoods	12.8	12.8	-	--	--	24.4	24.4	--	--	--
All species	250.2	86.8	9.0	15.5	138.9	1,343.9	397.9	51.1	86.3	808.6
New Mexico:										
Softwoods	5,735.2	2,810.8	1,346.8	112.9	1,464.7	24,054.6	12,181.6	5,876.5	430.3	5,566.2
Hardwoods	600.9	242.1	31.8	17.0	310.0	1,574.4	464.4	95.1	52.2	962.7
All species	6,336.1	3,052.9	1,378.6	129.9	1,774.7	25,629.0	12,646.0	5,971.6	482.5	6,528.9
Utah:										
Softwoods	3,689.1	2,935.2	411.7	--	342.2	14,809.1	11,710.1	1,685.9	--	1,413.1
Hardwoods	1,038.7	604.6	145.3	--	288.8	1,476.0	1,052.0	133.1	--	290.9
All species	4,727.8	3,539.8	557.0	--	631.0	16,285.1	12,762.1	1,819.0	--	1,704.0
Total Southern Rocky Mountain States:										
Softwoods	24,605.5	16,071.1	3,929.6	149.8	4,455.0	103,719.5	69,516.5	16,908.4	591.1	16,703.5
Hardwoods	3,785.6	2,130.9	374.8	17.4	1,262.5	7,196.0	4,202.0	608.1	53.0	2,332.9
All species	28,391.1	18,202.0	4,304.4	167.2	5,717.5	110,915.5	73,718.5	17,516.5	644.1	19,036.4
Total all Rocky Mountain States:										
Softwoods	87,711.8	57,862.2	10,372.1	5,231.9	14,245.6	355,106.5	235,581.5	42,699.0	23,666.3	53,159.7
Hardwoods	4,507.0	2,299.6	544.0	54.9	1,608.5	9,301.8	4,533.8	1,155.5	174.0	3,438.5
All species	92,218.8	60,161.8	10,916.1	5,286.8	15,854.1	364,408.3	240,115.3	43,854.5	23,840.3	56,598.2

[1]International 1/4-inch rule.

Table 26.--NET VOLUME OF TIMBER ON COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY TIMBER CLASS AND SOFTWOODS AND HARDWOODS, 1970

State	All timber classes			Growing stock			Sound cull trees			Rotten cull trees			Salvable dead trees		
	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods	All species	Hard-woods	Soft-woods	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods
	Million cubic feet														
orth. Rocky Mt. States:															
North Idaho	19,443.7	19,296.5	147.2	17,958.6	17,845.4	113.2	436.4	410.5	25.9	456.7	451.5	5.2	592.0	589.1	2.9
South Idaho	12,119.8	11,937.9	181.9	11,538.7	11,412.3	126.4	135.6	111.3	24.3	97.5	74.3	23.2	348.0	340.0	8.0
West. Montana	22,357.1	22,260.3	96.8	19,450.0	19,372.3	77.7	399.1	384.4	14.7	481.4	478.2	3.2	2,026.6	2,025.4	1.2
East. Montana	10,824.8	10,601.5	223.3	9,200.0	9,004.0	196.0	447.2	438.7	8.5	203.5	193.9	9.6	974.1	964.9	9.2
West. S. Dakota	1,060.1	1,052.2	7.9	1,007.3	1,001.1	6.2	2.1	1.1	1.0	3.7	3.0	.7	47.0	47.0	--
Wyoming	5,412.5	5,161.2	251.3	4,673.1	4,471.2	201.9	86.7	82.4	4.3	75.6	55.5	20.1	577.1	552.1	25.0
Total North. Rocky Mt. States:	71,218.0	70,309.6	908.4	63,827.7	63,106.3	721.4	1,507.1	1,428.4	78.7	1,318.4	1,256.4	62.0	4,664.8	4,518.5	46.3
South. Rocky Mt. States:															
Arizona	5,218.5	4,861.7	356.8	4,809.9	4,583.8	226.1	199.4	132.1	67.3	75.8	17.0	58.8	133.4	128.8	4.6
Colorado	14,942.1	12,059.6	2,882.5	12,267.1	10,360.0	1,907.1	317.5	246.0	71.5	1,016.8	243.1	773.7	1,340.7	1,210.5	130.2
Nevada	278.4	254.4	24.0	250.2	237.4	12.8	6.3	4.4	1.9	11.5	3.6	7.9	10.4	9.0	1.4
New Mexico	7,183.0	6,324.3	858.7	6,336.1	5,735.2	600.9	351.8	253.9	97.9	148.6	36.2	112.4	346.5	299.0	47.5
Utah	5,397.1	4,021.3	1,375.8	4,727.8	3,689.1	1,038.7	141.8	60.5	81.3	223.6	31.6	192.0	303.9	240.1	63.8
Total South. Rocky Mt. States:	33,019.1	27,521.3	5,497.8	28,391.1	24,605.5	3,785.6	1,016.8	[illegible]	319.9	1,474.3	331.5	1,144.8	[illegible]	1,887.4	247.5
Total all Rocky Mt. States:	104,237.1	97,830.9	6,406.2	92,218.8	87,711.8	4,507.0	2,523.9	2,[illegible]	398.6	2,792.7	1,587.9	1,206.8	6,[illegible]	[illegible]	293.8

Table 27.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoo
	Million cubic feet														
North Idaho															
5.0-6.9	1,350.4	1,316.1	277.8	42.9	418.1	69.4	38.4	208.6	136.3	79.2	45.4	(1)	34.3	1.5	32.8
7.0-8.9	1,883.3	1,862.3	409.9	68.6	479.4	135.5	74.6	312.3	205.3	97.3	79.2	0.2	21.0	--	21.0
9.0-10.9	2,018.6	2,004.0	477.8	114.3	360.4	155.5	76.1	392.3	189.8	134.1	102.6	1.1	14.6	--	14.6
11.0-12.9	1,997.6	1,987.8	465.4	138.4	238.8	211.9	96.1	404.5	179.5	143.0	108.9	1.3	9.8	--	9.8
13.0-14.9	1,846.2	1,839.4	440.3	147.6	123.8	180.7	100.9	432.9	158.4	167.4	85.6	1.8	6.8	--	6.8
15.0-16.9	1,675.1	1,670.6	384.6	124.7	53.2	211.5	102.0	418.6	136.0	163.7	74.8	1.5	4.5	--	4.5
17.0-18.9	1,458.0	1,455.7	318.2	112.9	40.2	188.5	99.5	365.1	109.1	154.2	67.9	.1	2.3	--	2.3
19.0-20.9	1,212.5	1,209.3	255.2	82.1	18.9	199.2	72.5	314.9	70.3	143.2	48.8	4.2	3.2	--	3.2
21.0-22.9	1,044.0	1,040.7	205.9	59.1	12.3	174.1	65.0	280.4	83.0	121.8	38.0	1.1	3.3	--	3.3
23.0-24.9	876.9	874.6	156.3	41.0	8.4	143.5	64.0	260.0	63.1	104.3	34.0	(1)	2.3	--	2.3
25.0-26.9	745.0	742.6	127.9	31.9	1.0	119.1	54.0	236.1	43.2	93.4	36.0	(1)	2.4	--	2.4
27.0-28.9	609.3	608.0	102.2	23.3	(1)	105.8	44.2	189.7	28.2	83.6	31.0	(1)	1.3	--	1.3
29.0+	1,241.7	1,234.3	168.1	85.2	--	232.8	99.0	326.9	69.3	195.9	56.3	.8	7.4	--	7.4
Total	17,958.6	17,845.4	3,789.6	1,072.0	1,754.5	2,127.5	986.3	4,142.3	1,471.5	1,681.1	808.5	12.1	113.2	1.5	111.7

[1]Less than 0.05 million cubic feet.

Table 28.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoo
	Million board feet, International 1/4-inch rule														
North Idaho															
9.0-10.9	9,675.3	9,675.3	2,226.7	414.6	1,795.8	827.0	380.0	1,875.3	1,073.9	642.6	433.0	6.4	0	0	0
11.0-12.9	10,365.5	10,307.3	2,327.6	623.6	1,307.0	1,163.7	535.7	2,089.1	1,034.9	689.5	529.4	6.8	58.2	--	58.2
13.0-14.9	9,679.9	9,641.2	2,251.7	731.9	678.6	998.5	563.7	2,267.9	901.3	810.2	428.1	9.3	38.7	--	38.7
15.0-16.9	9,207.5	9,179.7	2,100.8	672.3	297.6	1,224.3	583.2	2,268.5	801.8	815.7	408.2	7.3	27.8	--	27.8
17.0-18.9	8,080.1	8,065.4	1,757.3	630.0	223.0	1,095.7	567.0	1,996.4	642.1	778.9	374.7	.3	14.7	--	14.7
19.0-20.9	6,958.5	6,938.4	1,517.8	483.3	107.5	1,164.6	436.6	1,767.7	432.4	727.8	281.2	19.5	20.1	--	20.1
21.0-22.9	6,055.7	6,034.6	1,253.6	319.5	68.4	1,036.8	398.9	1,586.0	521.6	619.7	224.6	5.5	21.1	--	21.1
23.0-24.9	5,152.5	5,137.7	955.2	241.0	47.6	865.4	395.7	1,483.3	398.1	546.4	205.0	(1)	14.8	--	14.8
25.0-26.9	4,410.5	4,393.7	786.9	192.5	5.1	726.6	336.2	1,360.5	274.6	495.9	215.4	(1)	16.8	--	16.8
27.0-28.9	3,642.6	3,633.6	633.1	145.6	(1)	650.7	275.6	1,109.3	180.0	447.1	192.2	(1)	9.0	--	9.0
29.0+	7,413.1	7,357.8	1,046.6	560.2	--	1,417.2	623.3	1,895.1	446.1	1,037.3	327.7	4.3	55.3	--	55.3
Total	80,641.2	80,364.7	16,857.3	5,014.5	4,530.6	11,170.5	5,095.9	19,699.1	6,706.8	7,611.1	3,619.5	59.4	276.5	--	276.5

[1]Less than 0.05 million board feet.

Table 29.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million cubic feet														
South Idaho															
5.0-6.9	1,033.8	1,022.3	173.8	17.3	560.7	--	31.1	210.5	.3	0	--	28.6	11.5	11.3	.2
7.0-8.9	1,174.0	1,159.3	263.8	42.5	561.5	--	46.7	213.0	1.6	0	--	30.2	14.7	14.0	.7
9.0-10.9	1,193.4	1,172.3	274.5	54.3	502.7	--	74.7	241.2	1.7	0	--	23.2	21.1	16.4	4.7
11.0-12.9	1,058.1	1,034.7	319.7	66.3	337.1	--	80.3	211.4	4.6	0	--	15.3	23.4	15.4	8.0
13.0-14.9	951.7	933.9	359.2	88.2	185.9	--	90.8	191.2	4.3	0	--	14.3	17.8	7.4	10.4
15.0-16.9	888.3	878.4	386.3	79.6	104.7	--	114.1	173.4	10.0	0	--	10.3	9.9	1.1	8.8
17.0-18.9	762.5	754.6	361.2	79.6	51.8	--	114.5	134.2	3.5	0	--	9.8	7.9	.6	7.3
19.0-20.9	693.1	687.1	350.0	78.6	30.0	--	104.1	111.9	7.2	0	--	5.3	6.0	.2	5.8
21.0-22.9	621.4	616.9	313.8	106.4	11.3	--	98.7	75.7	5.0	0	--	6.0	4.5	--	4.5
23.0-24.9	554.4	551.2	267.3	109.2	6.0	--	97.4	63.5	3.2	0	--	4.6	3.2	--	3.2
25.0-26.9	500.1	497.6	240.6	128.3	3.6	--	77.6	41.6	3.1	0	--	2.8	2.5	--	2.5
27.0-28.9	410.6	408.8	196.6	120.7	2.1	--	53.5	29.2	3.6	0	--	3.1	1.8	--	1.8
29.0+	1,697.3	1,695.2	684.9	712.4	.8	--	177.7	103.2	8.8	0	--	7.4	2.1	.7	1.4
Total	11,538.7	11,412.3	4,191.7	1,683.4	2,358.2	--	1,161.2	1,800.0	56.9	0	--	160.9	126.4	67.1	59.3

Table 30.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million board feet, International 1/4-inch rule														
South Idaho															
9.0-10.9	5,822.6	5,822.6	1,177.9	175.6	2,812.2	--	376.6	1,148.6	10.0	0	--	121.7	0	0	0
11.0-12.9	5,566.6	5,454.5	1,592.2	292.0	1,924.1	--	431.2	1,102.1	27.0	0	--	85.9	112.1	73.0	39.1
13.0-14.9	5,070.8	4,984.7	1,857.1	444.5	1,067.2	--	492.8	1,015.9	25.9	0	--	81.3	86.1	33.1	53.0
15.0-16.9	4,785.3	4,732.7	2,033.5	425.1	600.7	--	620.7	935.3	58.9	0	--	58.5	52.6	4.8	47.8
17.0-18.9	4,166.2	4,124.2	1,945.1	439.4	302.9	--	621.7	738.9	21.3	0	--	54.9	42.0	2.5	39.5
19.0-20.9	3,810.2	3,777.6	1,894.6	453.4	172.0	--	563.8	618.9	44.8	0	--	30.1	32.6	.8	31.8
21.0-22.9	3,575.5	3,551.0	1,790.7	626.3	65.0	--	566.0	437.3	31.4	0	--	34.3	24.5	--	24.5
23.0-24.9	3,187.3	3,169.3	1,522.2	635.5	34.9	--	558.9	370.2	21.2	0	--	26.4	18.0	--	18.0
25.0-26.9	2,870.3	2,855.9	1,369.7	737.5	21.6	--	445.0	246.1	19.8	0	--	16.2	14.4	--	14.4
27.0-28.9	2,351.4	2,341.4	1,115.7	694.9	12.1	--	304.3	173.5	23.3	0	--	17.6	10.0	--	10.0
29.0+	9,818.5	9,807.7	3,864.2	4,215.7	4.9	--	1,004.9	620.3	56.4	0	--	41.3	10.8	2.8	8.0
Total	51,024.7	50,621.6	20,162.9	9,139.9	7,017.6	--	5,985.9	7,407.1	340.0	0	--	568.2	403.1	117.0	286.1

Table 31.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwo
	Million cubic feet														
Western Montana															
5.0-6.9	2,613.4	2,601.3	401.5	31.6	1,534.0	14.5	98.7	292.2	163.1	25.7	16.5	23.5	12.1	6.5	5.
7.0-8.9	3,117.2	3,105.1	552.9	88.9	1,620.0	22.7	165.5	355.5	201.2	25.3	25.7	47.4	12.1	6.7	5.
9.0-10.9	2,838.1	2,830.3	612.0	107.0	1,235.9	34.7	177.6	325.6	214.4	24.1	31.2	67.8	7.8	4.0	3.
11.0-12.9	2,341.1	2,331.8	689.0	164.2	657.6	45.7	189.9	260.1	219.4	24.8	30.3	50.8	9.3	4.4	4.
13.0-14.9	1,897.8	1,891.0	669.8	177.7	284.8	35.4	195.8	226.1	220.2	18.6	31.0	31.6	6.8	1.7	5.
15.0-16.9	1,499.5	1,490.3	557.6	173.2	102.8	36.0	193.5	124.8	227.0	21.2	29.1	25.1	9.2	.9	8.
17.0-18.9	1,253.7	1,247.1	470.2	154.0	29.6	34.7	171.0	94.4	226.5	22.7	30.9	13.1	6.6	1.1	5.
19.0-20.9	1,023.0	1,021.1	383.8	143.8	8.3	30.1	131.3	61.0	206.8	20.8	26.2	9.0	1.9	.3	1.
21.0-22.9	821.1	812.6	287.7	131.0	5.1	21.6	98.5	37.4	180.9	16.1	23.5	10.8	8.5	--	8.
23.0-24.9	547.5	545.2	181.7	87.0	3.0	18.6	64.6	19.6	132.4	12.5	19.3	6.5	2.3	(1)	2.
25.0-26.9	428.6	428.1	130.3	82.8	.1	16.5	44.3	9.8	116.6	9.9	16.8	1.0	.5	--	.
27.0-28.9	336.5	336.5	80.3	73.5	.1	12.1	40.6	7.2	89.6	6.9	12.5	3.7	--	--	-
29.0+	732.5	731.9	147.8	145.5	--	29.2	112.6	2.7	228.2	42.2	20.2	3.5	.6	--	.
Total	19,450.0	19,372.3	5,174.6	1,560.2	5,481.3	351.8	1,683.9	1,816.4	2,426.3	270.8	313.2	293.8	77.7	25.6	52.

(1)Less than 0.05 million cubic feet.

Table 32.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoo
	Million board feet, International 1/4-inch rule														
Western Montana															
9.0-10.9	12,659.6	12,659.6	2,395.2	361.1	5,738.4	164.1	869.0	1,509.7	1,105.5	106.0	115.7	294.9	0	0	0
11.0-12.9	11,313.0	11,268.4	3,201.2	713.3	3,221.2	229.8	988.7	1,260.1	1,148.8	117.5	136.0	251.8	44.6	20.7	23.9
13.0-14.9	9,993.3	9,959.9	3,445.9	990.8	1,474.7	183.1	1,069.6	1,171.2	1,226.6	93.5	144.7	159.8	33.4	8.4	25.0
15.0-16.9	8,299.4	8,253.1	3,057.8	1,010.2	560.0	206.8	1,076.8	656.4	1,293.2	111.4	148.2	132.3	46.3	4.4	41.9
17.0-18.9	7,152.	7,118.9	2,651.5	939.8	166.9	198.4	958.7	516.9	1,339.4	117.2	161.3	68.8	33.1	5.3	27.8
19.0-20.9	5,958.9	5,947.4	2,213.0	929.2	43.8	174.9	729.0	337.6	1,219.5	111.2	143.7	45.5	11.5	2.0	9.5
21.0-22.9	4,838.6	4,796.2	1,717.2	796.5	30.0	126.6	549.0	208.8	1,093.0	87.9	129.4	57.8	42.4	--	42.4
23.0-24.9	3,229.7	3,217.4	1,071.6	536.5	16.3	108.3	372.5	111.9	787.9	68.7	109.0	34.7	12.3	.2	12.1
25.0-26.9	2,565.4	2,561.7	770.2	528.1	.6	96.1	269.9	56.5	684.4	55.4	96.0	4.5	3.3	--	3.3
27.0-28.9	2,027.0	2,027.0	535.3	478.5	.2	71.8	249.9	40.4	520.1	37.3	73.3	20.2	--	--	--
29.0+	4,570.8	4,567.2	908.8	994.0	--	172.2	738.9	15.3	1,370.2	235.8	115.2	16.8	3.6	--	3.6
Total	72,607.3	72,376.8	21,967.7	8,278.0	11,252.1	1,732.1	7,872.0	5,884.8	11,788.6	1,141.9	1,372.5	1,087.1	230.5	41.0	189.5

Table 33.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million cubic feet														
Eastern Montana															
5.0-6.9	1,390.6	1,387.3	233.4	90.8	876.4	0	21.4	116.4	0	0	--	48.9	3.3	3.0	.3
7.0-8.9	1,827.0	1,816.6	328.2	92.2	1,076.0	0	94.8	173.4	0	0	--	52.0	10.4	[illegible]	2.2
9.0-10.9	1,602.1	1,585.3	357.0	126.6	870.1	0	90.4	96.6	0	0	--	44.6	16.8	8.2	8.6
11.0-12.9	1,254.3	1,232.1	313.0	135.5	586.4	0	95.8	67.8	0	0	--	33.6	22.2	4.5	17.7
13.0-14.9	983.6	959.7	320.7	97.5	364.5	0	106.0	53.9	0	0	--	17.1	23.9	--	23.9
15.0-16.9	683.3	658.9	263.7	95.2	172.1	0	94.0	21.8	0	0	--	12.1	24.4	1.1	23.3
17.0-18.9	464.8	442.1	214.7	64.2	67.5	0	80.4	10.8	0	0	--	4.5	22.7	--	22.7
19.0-20.9	315.1	295.0	166.6	41.3	31.8	0	49.1	3.2	0	0	--	3.0	20.1	.8	19.3
21.0-22.9	222.9	205.7	123.1	28.4	10.8	0	39.6	2.4	0	0	--	1.4	17.2	--	17.2
23.0-24.9	159.1	144.9	89.1	14.8	7.2	0	32.8	.4	0	0	--	.6	14.2	--	14.2
25.0-26.9	110.2	99.0	53.2	10.8	--	0	34.3	.1	0	0	--	.6	11.2	--	11.2
27.0-28.9	70.3	61.8	29.2	13.7	--	0	18.7	.1	0	0	--	.1	8.5	--	8.5
29.0+	116.7	115.6	71.5	5.8	--	0	37.5	.2	0	0	--	.6	1.1	--	1.1
Total	9,200.0	9,004.0	2,563.4	816.8	4,062.8	0	794.8	547.1	0	0	--	219.1	196.0	25.8	170.2

Table 34.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million board feet, International 1/4-inch rule														
Eastern Montana															
9.0-10.9	6,925.7	6,925.7	1,310.4	348.0	4,251.5	0	421.8	407.9	0	0	--	186.1	0	0	0
11.0-12.9	5,880.5	5,768.3	1,354.3	488.0	2,994.6	0	480.0	308.7	0	0	--	142.7	112.2	[illegible]	88.9
13.0-14.9	4,905.7	4,782.6	1,506.6	415.6	1,972.4	0	556.6	256.1	0	0	--	75.3	123.1	--	123.1
15.0-16.9	3,535.3	3,410.0	1,343.0	449.5	948.7	0	509.0	107.4	0	[illegible]	--	52.4	125.3	5.5	119.8
17.0-18.9	2,498.2	2,379.9	1,148.6	322.3	376.9	0	460.7	51.7	0	0	--	19.7	118.3	--	118.3
19.0-20.9	1,746.8	1,641.5	932.0	214.7	177.7	0	290.0	14.8	0	0	--	12.3	105.3	4.3	101.0
21.0-22.9	1,257.3	1,166.0	710.7	144.5	62.8	0	229.9	11.4	0	0	--	6.7	91.3	--	91.3
23.0-24.9	907.3	832.0	514.4	75.6	40.8	0	196.5	2.1	0	0	--	2.6	75.3	--	75.3
25.0-26.9	630.4	571.2	308.1	53.4	--	0	206.2	.8	0	0	--	2.7	59.2	--	59.2
27.0-28.9	406.0	359.9	172.1	67.5	--	0	119.4	.5	0	0	--	.4	46.1	--	46.1
29.0+	717.7	711.7	427.5	33.5	--	0	248.0	1.0	0	0	--	1.7	6.0	--	6.0
Total	29,410.9	28,548.8	9,727.7	2,612.6	10,825.4	0	3,718.1	1,162.4	0	0	--	502.6	862.1	33.1	829.0

Table 35.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	White spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
						Million cubic feet									
Western S. Dakota															
5.0-6.9	133.9	131.3	0	128.5	--	0	2.8	0	0	0	0	0	2.6	--	2.6
7.0-8.9	177.0	175.9	0	170.8	--	0	5.1	0	0	0	0	0	1.1	--	1.1
9.0-10.9	148.4	147.4	0	143.1	--	0	4.3	0	0	0	0	0	1.0	--	1.0
11.0-12.9	151.7	150.2	0	144.0	--	0	6.2	0	0	0	0	0	1.5	--	1.5
13.0-14.9	131.1	131.1	0	122.4	--	0	8.7	0	0	0	0	0	--	--	--
15.0-16.9	102.2	102.2	0	95.8	--	0	6.4	0	0	0	0	0	--	--	--
17.0-18.9	72.2	72.2	0	69.1	--	0	3.1	0	0	0	0	0	--	--	--
19.0-20.9	42.6	42.6	0	39.7	--	0	2.9	0	0	0	0	0	--	--	--
21.0-22.9	24.6	24.6	0	20.4	--	0	4.2	0	0	0	0	0	--	--	--
23.0-24.9	12.8	12.8	0	10.8	--	0	2.0	0	0	0	0	0	--	--	--
25.0-26.9	7.9	7.9	0	7.9	--	0	--	0	0	0	0	0	--	--	--
27.0-28.9	2.6	2.6	0	2.6	--	0	--	0	0	0	0	0	--	--	--
29.0+	.3	.3	0	.3	--	0	--	0	0	0	0	0	--	--	--
Total	1,007.3	1,001.1	0	955.4	--	0	45.7	0	0	0	0	0	6.2	--	6.2

Table 36.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	White spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
						Million board feet, International 1/4-inch rule									
Western S. Dakota															
9.0-10.9	730.4	730.4	0	704.3	--	0	26.1	0	0		0	0	0	0	0
11.0-12.9	722.0	713.0	0	680.4	--	0	32.6	0	0		0	0	9.0	--	9.0
13.0-14.9	620.8	620.8	0	576.9	--	0	43.9	0	0		0	0	--	--	--
15.0-16.9	518.3	518.3	0	484.1	--	0	34.2	0	0	0		0	--	--	--
17.0-18.9	371.8	371.8	0	355.6	--	0	16.2	0	0	0		0	--	--	--
19.0-20.9	226.4	226.4	0	211.0	--	0	15.4	0	0	0	0	0	--	--	--
21.0-22.9	127.9	127.9	0	105.0	--	0	22.9	0	0	0	0	0	--	--	--
23.0-24.9	67.4	67.4	0	57.6	--	0	9.8	0	0	0	0	0	--	--	--
25.0-26.9	41.6	41.6	0	41.6	--	0	--	0	0	0	0	0	--	--	--
27.0-28.9	15.1	15.1	0	15.1	--	0	--	0	0	0	0	0	--	--	--
29.0+	2.0	2.0	0	2.0	--	0	--	0	0	0	0	0	--	--	--
Total	3,443.7	3,434.7	0	3,233.6	--	0	201.1	0	0	0	0	0	9.0	--	9.0

Table 37.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million cubic feet														
Wyoming															
5.0-6.9	678.0	626.2	51.7	47.0	418.5	0	43.0	58.8	0	0	0	7.2	51.8	51.7	.1
7.0-8.9	780.7	721.5	29.4	91.3	435.4	0	65.9	74.3	0	0	0	25.2	59.2	50.4	8.8
9.0-10.9	811.2	770.5	72.3	128.0	403.6	0	57.8	85.6	0	0	0	23.2	40.7	40.5	.2
11.0-12.9	690.4	664.1	39.8	149.0	270.4	0	113.1	59.8	0	0	0	32.0	26.3	4.1	22.2
13.0-14.9	524.3	505.8	40.2	126.2	187.4	0	78.3	46.4	0	0	0	27.3	18.5	18.2	.3
15.0-16.9	389.9	384.7	32.7	88.1	109.2	0	106.1	32.5	0	0	0	16.1	5.2	5.2	--
17.0-18.9	274.3	274.2	29.0	58.0	70.0	0	83.3	19.3	0	0	0	14.6	.1	.1	--
19.0-20.9	174.6	174.5	27.7	33.4	29.2	0	73.1	5.1	0	0	0	6.0	.1	.1	--
21.0-22.9	120.7	120.7	25.7	17.6	9.1	0	58.7	4.4	0	0	0	5.2	([1])	([1])	--
23.0-24.9	76.3	76.3	20.5	9.0	3.4	0	39.2	2.0	0	0	0	2.2	--	--	--
25.0-26.9	54.1	54.1	6.1	4.3	3.1	0	36.1	3.5	0	0	0	1.0	--	--	--
27.0-28.9	35.5	35.5	12.7	1.1	1.8	0	18.8	1.0	0	0	0	.1	--	--	--
29.0+	63.1	63.1	17.2	4.7	.5	0	39.5	.9	0	0	0	.3	--	--	--
Total	4,673.1	4,471.2	405.0	757.7	1,941.6	0	812.9	393.6	0	0	0	160.4	201.9	170.3	31.6

[1]Less than 0.05 million cubic feet.

Table 38.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE NORTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Western larch	Western redcedar	Hemlock	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million board feet, International 1/4-inch rule														
Wyoming															
9.0-10.9	3,794.4	3,794.4	322.8	408.3	2,178.2	0	323.4	417.8	0	0	0	143.9	0	0	0
11.0-12.9	3,391.4	3,242.2	177.4	562.0	1,472.3	0	551.0	299.9	0	0	0	179.6	149.2	26.4	122.8
13.0-14.9	2,691.7	2,561.3	186.9	534.6	1,036.4	0	413.7	242.0	0	0	0	147.7	130.4	128.0	2.4
15.0-16.9	2,089.7	2,046.3	162.1	417.5	628.7	0	570.8	175.0	0	0	0	92.2	43.4	43.4	--
17.0-18.9	1,502.8	1,501.7	148.8	297.2	410.3	0	460.9	105.5	0	0	0	79.0	1.1	1.1	--
19.0-20.9	954.9	954.6	146.7	179.1	164.3	0	402.4	29.0	0	0	0	33.1	.3	.3	--
21.0-22.9	629.6	629.4	156.2	73.1	52.3	0	292.1	26.0	0	0	0	29.7	.2	.2	--
23.0-24.9	434.7	434.7	115.7	44.6	18.6	0	230.3	12.3	0	0	0	13.2	--	--	--
25.0-26.9	312.7	312.7	35.8	22.1	18.1	0	211.4	19.6	0	0	0	5.7	--	--	--
27.0-28.9	203.8	203.8	70.5	7.3	9.9	0	109.4	6.3	0	0	0	.4	--	--	--
29.0+	359.3	359.3	96.2	25.6	3.1	0	227.1	5.2	0	0	0	2.1	--	--	--
Total	16,365.0	16,040.4	1,619.1	2,571.4	5,992.2	0	3,792.5	1,338.6	0	0	0	726.6	324.6	199.4	125.2

Table 39.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million cubic feet											
Arizona												
5.0-6.9	201.9	174.7	15.9	135.6	--	--	10.9	9.7	2.6	27.2	27.2	--
7.0-8.9	251.7	218.5	16.1	175.9	--	--	13.2	11.0	2.3	33.2	33.2	--
9.0-10.9	331.2	298.2	19.4	239.5	--	--	18.7	18.6	2.0	33.0	33.0	--
11.0-12.9	393.9	354.4	23.1	270.5	--	--	35.6	20.9	4.3	39.5	39.5	--
13.0-14.9	421.3	387.9	24.4	302.7	--	--	36.7	20.7	3.4	33.4	33.4	--
15.0-16.9	458.4	434.5	27.1	338.7	--	--	44.0	21.7	3.0	23.9	23.9	--
17.0-18.9	470.5	452.4	27.8	366.1	--	--	36.6	17.9	4.0	18.1	18.1	--
19.0-20.9	452.6	443.1	24.2	364.9	--	--	32.7	17.1	4.2	9.5	9.5	--
21.0-22.9	403.3	398.1	20.8	337.8	--	--	25.7	11.0	2.8	5.2	5.2	--
23.0-24.9	373.0	371.3	29.0	310.6	--	--	15.6	13.4	2.7	1.7	1.7	--
25.0-26.9	316.2	315.1	22.1	269.4	--	--	11.6	9.6	2.4	1.1	1.1	--
27.0-28.9	263.4	263.2	16.8	226.0	--	--	4.5	14.5	1.4	0.2	0.2	--
29.0+	472.5	472.4	66.2	350.6	--	--	8.4	43.8	3.4	0.1	0.1	--
Total	4,809.9	4,583.8	332.9	3,688.3	--	--	294.2	229.9	38.5	226.1	226.1	--

Table 40.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million board feet, International 1/4-inch rule											
Arizona												
9.0-10.9	852.3	852.3	83.7	570.0	--	--	106.0	81.8	10.8	0	0	0
11.0-12.9	1,536.6	1,340.3	110.1	918.4	--	--	188.2	100.8	22.8	196.3	196.3	--
13.0-14.9	1,875.5	1,704.5	125.3	1,255.1	--	--	199.5	106.6	18.0	171.0	171.0	--
15.0-16.9	2,197.8	2,074.2	143.3	1,553.9	--	--	244.9	116.0	16.1	123.6	123.6	--
17.0-18.9	2,381.0	2,286.6	150.6	1,806.0	--	--	210.0	97.9	22.1	94.4	94.4	--
19.0-20.9	2,381.4	2,330.8	124.2	1,899.7	--	--	189.9	93.6	23.4	50.6	50.6	--
21.0-22.9	2,193.4	2,165.9	111.6	1,832.0	--	--	147.7	59.7	14.9	27.5	27.5	--
23.0-24.9	2,068.7	2,060.5	158.3	1,726.6	--	--	92.2	68.8	14.6	8.2	8.2	--
25.0-26.9	1,786.0	1,780.5	122.9	1,523.4	--	--	68.9	52.3	13.0	5.5	5.5	--
27.0-28.9	1,503.1	1,501.9	95.5	1,293.7	--	--	27.4	77.6	7.7	1.2	1.2	--
29.0+	2,805.6	2,805.2	382.1	2,129.1	--	--	51.7	224.1	18.2	0.4	0.4	--
Total	21,581.4	20,902.7	1,607.6	16,507.9	--	--	1,526.4	1,079.2	181.6	678.7	678.7	--

Table 41.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million cubic feet											
Colorado												
5.0-6.9	1,949.0	1,662.0	221.5	44.9	658.6	0	361.1	335.1	40.8	287.0	285.9	1.1
7.0-8.9	1,819.8	1,306.0	111.2	54.2	454.3	0	375.1	293.6	17.6	513.8	504.5	9.3
9.0-10.9	1,734.1	1,319.4	103.7	53.3	375.3	0	504.5	259.0	23.6	414.7	399.8	14.9
11.0-12.9	1,543.3	1,264.6	87.3	85.5	327.9	0	540.9	207.2	15.8	278.7	256.7	22.0
13.0-14.9	1,336.6	1,144.6	93.4	90.5	246.7	0	536.7	161.5	15.8	192.0	178.3	13.7
15.0-16.9	1,087.6	978.5	97.5	77.1	134.8	0	518.4	138.8	11.9	109.1	98.8	10.3
17.0-18.9	836.8	778.3	75.3	57.1	53.4	0	474.4	111.5	6.7	58.5	50.5	8.0
19.0-20.9	607.0	580.2	62.4	58.5	31.5	0	356.1	67.5	4.3	26.8	21.8	5.0
21.0-22.9	447.6	435.8	50.9	49.4	6.5	0	287.0	40.5	1.5	11.8	6.3	5.5
23.0-24.9	334.2	325.6	23.6	45.3	4.8	0	222.7	27.9	1.3	8.6	4.4	4.2
25.0-26.9	213.4	210.1	24.6	30.2	--	0	142.2	12.9	.2	3.3	.1	3.2
27.0-28.9	154.0	151.2	15.6	23.4	.4	0	98.4	13.2	.2	2.8	.3	2.5
29.0+	203.7	203.7	37.6	45.5	--	0	105.7	14.9	--	--	--	--
Total	12,267.1	10,360.0	1,004.6	714.9	2,294.2	0	4,563.0	1,683.0	133.7	1,907.1	1,808.4	98.7

Table 42.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million board feet, International 1/4-inch rule											
Colorado												
9.0-10.9	7,642.8	7,642.8	582.8	117.7	2,301.2	0	3,054.7	1,446.0	140.4	--	--	
11.0-12.9	8,174.8	6,809.2	439.3	306.7	1,844.4	0	3,046.9	1,090.4	81.5	1,365.6	1,284.4	81.2
13.0-14.9	7,363.4	6,407.4	517.7	449.0	1,420.3	0	3,060.3	876.4	83.7	956.0	900.0	56.0
15.0-16.9	6,183.5	5,625.9	572.7	431.3	790.4	0	2,995.2	772.8	63.5	557.6	514.7	42.9
17.0-18.9	4,863.7	4,557.7	457.1	346.9	321.2	0	2,764.4	628.7	39.4	306.0	272.2	33.8
19.0-20.9	3,558.5	3,427.9	390.5	363.7	192.7	0	2,073.1	381.4	26.5	130.6	109.4	21.2
21.0-22.9	2,657.9	2,600.7	343.9	229.1	41.5	0	1,736.5	241.5	8.2	57.2	33.4	23.8
23.0-24.9	2,042.0	1,998.7	152.1	244.8	32.8	0	1,393.7	166.4	8.9	43.3	25.5	17.8
25.0-26.9	1,316.2	1,302.0	156.2	170.1	--	0	900.1	74.7	.9	14.2	.8	13.4
27.0-28.9	950.6	938.6	97.0	134.7	2.6	0	623.7	79.1	1.5	12.0	2.0	10.0
29.0+	1,322.7	1,322.7	238.6	297.8	--	0	698.0	88.3	--	--	--	--
Total	46,076.1	42,633.6	3,947.9	3,091.8	6,947.1	0	22,346.6	5,845.7	454.5	3,442.5	3,142.4	300.1

Table 43.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa & Jeffrey pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million cubic feet											
Nevada												
5.0-6.9	7.3	4.3	[1]	.4	.1	.1	.5	1.8	1.4	3.0	3.0	--
7.0-8.9	8.0	5.8	--	1.6	.7	.2	1.1	1.7	.5	2.2	2.2	--
9.0-10.9	11.2	9.1	--	2.7	1.1	.1	1.5	3.3	.4	2.1	2.1	--
11.0-12.9	15.5	11.7	--	4.4	1.7	.3	1.8	2.8	.7	3.8	3.4	.4
13.0-14.9	14.3	12.6	--	5.3	2.1	.5	.8	3.5	.4	1.7	1.5	.2
15.0-16.9	16.9	16.9	--	6.9	1.4	.5	2.5	4.6	1.0	[1]	[1]	--
17.0-18.9	16.6	16.6	--	7.5	.8	.4	.9	5.3	1.7	[1]	[1]	--
19.0-20.9	17.4	17.4	--	7.2	1.1	.8	1.7	5.6	1.0	[1]	[1]	--
21.0-22.9	17.6	17.6	--	6.3	1.4	.5	1.6	6.2	1.6	[1]	--	[1]
23.0-24.9	17.6	17.6	--	7.0	.8	.7	1.5	5.8	1.8	--	--	--
25.0-26.9	16.3	16.3	--	5.9	.7	1.3	1.6	6.1	.7	--	--	--
27.0-28.9	15.9	15.9	--	4.5	.6	1.1	2.7	5.9	1.1	--	--	--
29.0+	75.6	75.6	--	19.2	1.4	7.0	1.7	43.6	2.7	--	--	--
Total	250.2	237.4	[1]	78.9	13.9	13.5	19.9	96.2	15.0	12.8	12.2	0.6

[1]Less than 0.05 million cubic feet.

Table 44.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa & Jeffrey pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other[1] softwoods	Total all hardwoods	Aspen	Other[2] hardwoods
Nevada	*Million board feet, International 1/4-inch rule*											
9.0-10-9	34.4	34.4	--	5.0	6.6	.5	7.1	13.5	1.7	0	0	0
11.0-12.9	68.2	51.7	--	14.4	9.4	1.5	9.6	13.6	3.2	16.5	14.7	1.8
13.0-14.9	68.5	61.3	--	23.3	11.5	2.7	4.2	17.8	1.8	7.2	6.4	.8
15.0-16.9	89.7	89.5	--	35.2	8.4	2.4	12.6	24.9	6.0	.2	.2	--
17.0-18.9	94.4	94.1	--	42.2	4.6	2.1	4.8	30.9	9.5	.3	.3	--
19.0-20.9	102.4	102.2	--	42.9	6.3	5.1	8.5	33.8	5.6	.2	.2	--
21.0-22.9	106.5	106.5	--	38.5	8.9	3.0	8.5	38.1	9.5	[1]	--	[1]
23.0-24.9	107.5	107.5	--	42.2	5.1	4.6	8.6	36.3	10.7	--	--	--
25.0-26.9	98.4	98.4	--	34.5	3.8	7.8	8.7	39.0	4.6	--	--	--
27.0-28.9	93.6	93.6	--	26.7	3.2	6.6	14.4	36.0	6.7	--	--	--
29.0+	480.3	480.3	--	124.1	8.8	43.5	9.0	278.5	16.4	--	--	--
Total	1,343.9	1,319.5	--	429.0	76.6	79.8	96.0	562.4	75.7	24.4	21.8	2.6

[1]Less than 0.05 million board feet.

Table 45.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

e; diam. s (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
						Million cubic feet						
Mexico												
0-6.9	523.0	418.2	77.8	163.4	0	0	55.6	102.9	18.5	104.8	104.8	--
0-8.9	547.7	428.0	94.7	177.2	0	0	58.0	71.5	26.6	119.7	119.7	--
0-10.9	511.3	404.0	79.1	161.5	0	0	73.7	75.4	14.3	107.3	107.3	--
0-12.9	621.7	527.2	98.3	218.4	0	0	90.1	85.9	34.5	94.5	94.5	--
0-14.9	609.4	543.3	114.2	255.8	0	0	72.7	77.2	23.4	66.1	66.1	--
0-16.9	724.1	675.3	102.5	407.2	0	0	82.8	61.2	21.6	48.8	48.8	--
0-18.9	685.6	652.8	94.8	426.0	0	0	70.5	53.1	8.4	32.8	32.8	
.0-20.9	558.6	541.1	91.2	363.7	0	0	41.3	34.8	10.1	17.5	17.5	--
.0-22.9	456.9	447.6	65.3	308.2	0	0	33.2	34.4	6.5	9.3	9.3	--
.0-24.9	362.9	362.8	60.3	257.6	0	0	20.5	22.7	1.7	0.1	0.1	--
.0-26.9	272.8	272.8	35.4	214.2	0	0	6.3	13.6	3.3	--	--	--
.0-28.9	197.5	197.5	32.1	146.6	0	0	3.8	11.5	3.5	--	--	--
.0+	264.6	264.6	85.4	144.3	0	0	5.6	26.1	3.2	--	--	--
Total	6,336.1	5,735.2	1,031.1	3,244.1	0	0	614.1	670.3	175.6	600.9	600.9	--

Table 46.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

tate; diam. lass (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
						Million board feet, International 1/4-inch rule						
ew Mexico												
9.0-10.9	1,598.0	1,598.0	441.7	323.5	0	0	444.2	302.0	86.6	0	0	0
1.0-12.9	2,622.1	2,091.8	499.4	626.5	0	0	445.5	359.2	161.2	530.3	530.3	--
3.0-14.9	2,835.2	2,445.6	646.5	940.3	0	0	381.2	364.1	113.5	389.6	389.6	--
5.0-16.9	3,533.4	3,243.2	600.2	1,773.9	0	0	448.9	309.0	111.2	290.2	290.2	--
7.0-18.9	3,490.6	3,294.0	590.7	1,990.0	0	0	387.5	280.4	45.4	196.6	196.6	--
9.0-20.9	2,929.2	2,820.8	547.5	1,807.7	0	0	222.7	187.0	55.9	108.4	108.4	--
1.0-22.9	2,458.0	2,399.3	380.0	1,623.3	0	0	178.4	180.8	36.8	58.7	58.7	--
3.0-24.9	1,995.0	1,994.4	358.3	1,398.6	0	0	111.5	116.2	9.8	0.6	0.6	--
5.0-26.9	1,523.9	1,523.9	210.6	1,189.9	0	0	32.2	72.0	19.2	--	--	--
7.0-28.9	1,115.8	1,115.8	198.4	818.4	0	0	19.5	60.1	19.4	--	--	--
9.0+	1,527.8	1,527.8	495.2	844.0	0	0	32.5	137.2	18.9	--	--	--
Total	25,629.0	24,054.6	4,968.5	13,336.1	0	0	2,704.1	2,368.0	677.9	1,574.4	1,574.4	--

Table 47.--NET VOLUME OF GROWING STOCK ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwood
	Million cubic feet											
Utah												
5.0-6.9	698.2	463.0	62.4	5.2	210.4	0	81.9	95.7	7.4	235.2	235.2	--
7.0-8.9	734.1	460.6	64.5	16.4	176.3	0	107.4	91.9	4.1	273.5	273.5	--
9.0-10.9	648.5	453.8	61.7	19.5	153.5	0	111.1	101.9	6.1	194.7	194.7	--
11.0-12.9	535.1	376.1	67.2	21.5	98.0	0	97.5	88.0	3.9	159.0	158.9	0.1
13.0-14.9	468.5	376.3	74.9	25.4	89.8	0	102.1	78.3	5.8	92.2	92.1	0.1
15.0-16.9	378.0	336.1	83.4	29.6	57.7	0	98.4	59.9	7.1	41.9	41.9	(1)
17.0-18.9	315.8	293.6	80.4	24.4	25.3	0	95.8	64.7	3.0	22.2	22.2	(1)
19.0-20.9	247.7	237.7	66.3	29.0	16.1	0	79.1	44.9	2.3	10.0	10.0	(1)
21.0-22.9	167.9	163.0	46.5	24.2	7.4	0	51.8	30.0	3.1	4.9	4.9	(1)
23.0-24.9	140.9	137.5	39.8	20.7	2.5	0	52.0	19.3	3.2	3.4	3.4	--
25.0-26.9	105.3	104.2	23.1	21.2	1.9	0	40.2	17.2	0.6	1.1	1.1	(1)
27.0-28.9	77.5	76.9	18.6	19.4	0.8	0	26.4	9.8	1.9	0.6	0.6	--
29.0+	210.3	210.3	52.0	64.3	0.3	0	61.1	31.6	1.0	--	--	--
Total	4,727.8	3,689.1	740.8	320.8	840.0	0	1,004.8	733.2	49.5	1,038.7	1,038.5	0.2

[1]Less than 0.05 million cubic feet.

Table 48.--NET VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND IN THE SOUTHERN ROCKY MOUNTAIN STATES BY DIAMETER CLASS AND SPECIES, 1970

State; diam. class (inches)	Total all species	Total softwoods	Douglas-fir	Ponderosa pine	Lodgepole pine	Western white pine	Engelmann spruce	True firs	Other softwoods	Total all hardwoods	Aspen	Other hardwoods
	Million board feet, International 1/4-inch rule											
Utah												
9.0-10.9	2,393.7	2,393.7	520.3	50.2	819.9	0	577.8	561.6	44.9	0	0	0
11.0-12.9	2,542.4	1,864.3	300.6	75.2	534.7	0	512.5	421.6	19.9	678.3	678.1	0.2
13.0-14.9	2,337.4	1,936.8	367.1	115.3	482.2	0	546.8	396.0	29.4	400.6	400.4	0.2
15.0-16.9	1,954.0	1,761.9	421.2	153.4	312.3	0	523.9	313.7	37.4	192.1	192.0	0.1
17.0-18.9	1,681.2	1,575.2	425.4	134.5	138.3	0	515.2	344.6	17.2	106.0	105.9	0.1
19.0-20.9	1,338.1	1,292.6	371.1	153.5	88.0	0	422.5	244.0	13.5	45.5	45.4	0.1
21.0-22.9	953.3	927.5	269.8	134.2	41.2	0	293.6	171.0	17.7	25.8	25.8	(1)
23.0-24.9	825.9	788.1	223.0	128.4	13.9	0	295.3	109.2	18.3	17.8	17.8	--
25.0-26.9	601.3	595.1	130.3	126.8	10.3	0	225.8	98.5	3.4	6.2	6.2	(1)
27.0-28.9	446.7	443.0	105.1	118.8	4.5	0	148.0	56.1	10.5	3.7	3.7	--
29.0+	1,230.9	1,230.9	294.7	406.0	1.9	0	342.5	180.0	5.8	--	--	--
Total	14,285.1	14,809.1	3,247.6	1,596.3	2,447.2	0	4,403.7	2,896.3	218.0	1,476.0	1,475.3	0.7

[1]Less than 0.05 million board feet.

Table 49.--NET ANNUAL GROWTH OF GROWING STOCK AND SAWTIMBER ON COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY SOFTWOODS AND HARDWOODS AND OWNER GROUP, 1970

State	All owner groups	National Forest	Other public	Forest industry	Other private	All owner groups	National Forest	Other public	Forest industry	Other private
	Thousand cubic feet growing stock					Thousand board feet, net volume[1]				
rth. Rocky Mt. States:										
orth Idaho:										
Softwoods	347,209	91,709	64,465	67,421	123,614	1,327,768	400,768	218,207	281,772	427,021
Hardwoods	3,694	694	144	346	2,510	5,379	2,379	--	680	2,320
All species	350,903	92,403	64,609	67,767	126,124	1,333,147	403,147	218,207	282,452	429,341
outh Idaho:										
Softwoods	149,772	116,872	18,008	5,928	8,964	664,319	523,319	76,994	25,841	38,165
Hardwoods	2,288	388	1,081	256	563	7,680	680	3,829	1,275	1,896
All species	152,060	117,260	19,089	6,184	9,527	671,999	523,999	80,823	27,116	40,061
Western Montana:										
Softwoods	334,582	227,482	27,369	28,299	51,432	1,173,354	738,354	113,346	129,050	192,604
Hardwoods	1,280	480	122	136	542	4,673	673	862	813	[illegible]
All species	335,862	227,962	27,491	28,435	51,974	1,178,027	739,027	114,208	129,863	194,929
Eastern Montana:										
Softwoods	105,062	58,862	13,208	184	32,808	300,046	187,046	32,218	[illegible]	80,253
Hardwoods	2,218	118	588	--	1,512	8,168	168	2,226	--	5,774
All species	107,280	58,980	13,796	184	34,320	308,214	187,214	34,444	529	86,027
Western S. Dakota:										
Softwoods	26,910	19,310	1,536	369	5,695	98,815	78,815	4,437	[illegible]	14,605
Hardwoods	200	--	31	10	159	--	--	--	--	--
All species	27,110	19,310	1,567	379	5,854	98,815	78,815	4,437	958	14,605
Wyoming:										
Softwoods	42,754	26,654	5,815	800	9,485	160,345	106,345	20,496	2,891	30,613
Hardwoods	2,999	1,299	687	50	963	3,937	937	1,231	91	1,678
All species	45,753	27,953	6,502	850	10,448	164,282	107,282	21,727	2,982	32,291
otal N. Rocky Mt. States:										
Softwoods	1,006,289	540,889	130,401	103,001	231,998	3,724,647	2,034,647	465,698	441,041	783,261
Hardwoods	12,679	2,979	2,653	798	6,249	29,837	4,837	8,148	2,859	13,993
All species	1,018,968	543,868	133,054	103,799	238,247	3,754,484	2,039,484	473,846	443,900	797,254

[1]International 1/4-inch rule.

Table 50.--NET ANNUAL GROWTH OF GROWING STOCK AND SAWTIMBER ON COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY SOFTWOODS AND HARDWOODS AND OWNER GROUP, 1970

State	All owner groups	National Forest	Other public	Forest industry	Other private	All owner groups	National Forest	Other public	Forest industry	Other private
	Thousand cubic feet growing stock					[illegible]				
South. Rocky Mt. States:										
Arizona:										
Softwoods	66,239	50,639	13,393	--	2,207	289,445	231,445	51,677	—	6,323
Hardwoods	5,036	3,436	853	--	747	16,850	13,850	1,225	--	1,775
All species	71,275	54,075	14,246	--	2,954	306,295	245,295	52,902	--	8,098
Colorado:										
Softwoods	123,393	86,793	7,955	212	28,433	609,698	472,698	31,602	[illegible]	104,780
Hardwoods	33,945	23,845	1,907	5	8,188	62,036	46,036	2,742	6	13,252
All species	157,338	110,638	9,862	217	36,621	671,734	518,734	34,344	624	118,032
Nevada:										
Softwoods	2,052	652	105	186	1,109	10,102	3,102	540	948	5,512
Hardwoods	241	241	--	--	--	310	310	--	--	--
All species	2,293	893	105	186	1,109	10,412	3,412	540	948	5,512
New Mexico:										
Softwoods	65,888	38,588	9,118	1,257	16,925	226,625	170,625	22,031	2,334	31,635
Hardwoods	9,173	2,973	-99	289	6,010	25,891	14,891	-789	[illegible]	11,264
All species	75,061	41,561	9,019	1,546	22,935	252,516	185,516	21,242	2,859	42,899
Utah:										
Softwoods	25,598	27,198	-972	--	-628	75,409	104,409	-16,201	--	-12,799
Hardwoods	10,609	4,409	1,662	--	4,538	9,713	8,713	226	--	774
All species	36,207	31,607	690	--	3,910	85,122	113,122	-15,975	--	-12,025
Total S. Rocky Mt. States:										
Softwoods	283,170	203,870	29,599	1,655	48,046	1,211,279	982,279	89,649	3,900	135,451
Hardwoods	59,004	34,904	4,323	294	19,483	114,800	83,800	3,404	[illegible]	27,065
All species	342,174	238,774	33,922	1,949	67,529	1,326,079	1,066,079	93,053	4,431	162,516
Total all Rocky Mt. States:										
Softwoods	1,289,459	744,759	160,000	104,656	280,044	4,935,926	3,016,926	555,347	444,941	918,712
Hardwoods	71,683	37,883	6,976	1,092	25,732	144,637	88,637	11,552	3,390	41,058
All species	1,361,142	782,642	166,976	105,748	305,776	5,080,563	3,105,563	566,899	448,331	959,770

[1]International 1/4-inch rule.

Table 51.--ANNUAL MORTALITY OF GROWING STOCK AND SAWTIMBER ON COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY SOFTWOODS AND HARDWOODS AND OWNER GROUP, 1970

State	All owner groups	National Forest	Other public	Forest industry	Other private	All owner groups	National Forest	Other public	Forest industry	Other private
	Thousand cubic feet growing stock					*Thousand board feet sawtimber*[1]				
North. Rocky Mt. States:										
North Idaho:										
Softwoods	112,252	82,352	12,854	6,965	10,081	549,599	416,599	62,920	33,092	36,988
Hardwoods	391	191	--	200	--	1,604	604	--	1,000	--
All species	112,643	82,543	12,854	7,165	10,081	551,203	417,203	62,920	34,092	36,988
South Idaho:										
Softwoods	87,931	76,831	6,154	1,982	2,964	415,581	373,581	23,477	7,273	11,250
Hardwoods	1,220	620	326	115	159	2,928	928	1,087	384	529
All species	89,151	77,451	6,480	2,097	3,123	418,509	374,509	24,564	7,657	11,779
Western Montana:										
Softwoods	110,040	80,140	6,734	12,862	10,304	418,939	292,939	28,333	56,667	41,000
Hardwoods	481	281	14	9	177	1,171	1,171	--	--	--
All species	110,521	80,421	6,748	12,871	10,481	420,110	294,110	28,333	56,667	41,000
Eastern Montana:										
Softwoods	51,831	22,331	8,513	58	20,929	159,402	72,402	25,110	175	61,715
Hardwoods	1,504	4	433	--	1,067	6,006	6	1,733	--	4,267
All species	53,335	22,335	8,946	58	21,996	165,408	72,408	26,843	175	65,982
Western South Dakota:										
Softwoods	1,282	982	81	14	205	5,512	4,512	282	46	672
Hardwoods	--	--	--	--	--	--	--	--	--	--
All species	1,282	982	81	14	205	5,512	4,512	282	46	672
Wyoming:										
Softwoods	24,061	15,961	4,135	273	3,692	87,880	62,880	11,904	869	12,227
Hardwoods	1,106	106	415	30	555	2,158	158	800	56	1,144
All species	25,167	16,067	4,550	303	4,247	90,038	63,038	12,704	925	13,371
Total N. Rocky Mt. States:										
Softwoods	387,397	278,597	38,471	22,154	48,175	1,636,913	1,222,913	152,026	98,122	163,852
Hardwoods	4,702	1,202	1,188	354	1,958	13,867	2,867	3,620	1,440	5,940
All species	392,099	279,799	39,659	22,508	50,133	1,650,780	1,225,780	155,646	99,562	169,792

[1]International 1/4-inch rule.

Table 52.--ANNUAL MORTALITY OF GROWING STOCK AND SAWTIMBER ON COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY SOFTWOODS AND HARDWOODS AND OWNER GROUP, 1970

State	All owner groups	National Forest	Other public	Forest industry	Other private	All owner groups	National Forest	Other public	Forest industry	Other private
	Thousand cubic feet growing stock					*Thousand board feet sawtimber*[1]				
South. Rocky Mt. States:										
Arizona:										
Softwoods	13,907	6,907	6,133	--	867	64,145	32,145	28,036	--	3,964
Hardwoods	1,064	664	350	--	50	2,867	1,867	876	--	124
All species	14,971	7,571	6,483	--	917	67,012	34,012	28,912	--	4,088
Colorado:										
Softwoods	72,884	44,884	5,443	171	22,386	296,642	202,642	17,631	470	75,899
Hardwoods	17,503	10,803	1,188	5	5,507	37,392	27,392	1,701	4	8,295
All species	90,387	55,687	6,631	176	27,893	334,034	230,034	19,332	474	84,194
Nevada:										
Softwoods	1,587	487	41	96	963	8,885	2,885	213	511	5,276
Hardwoods	35	35	--	--	--	95	95	--	--	--
All species	1,622	522	41	96	963	8,980	2,980	213	511	5,276
New Mexico:										
Softwoods	39,420	17,820	6,719	1,059	13,822	155,731	72,731	25,819	4,068	53,113
Hardwoods	7,475	4,575	902	142	1,856	14,705	6,705	2,489	392	5,119
All species	46,895	22,395	7,621	1,201	15,678	170,436	79,436	28,308	4,460	58,232
Utah:										
Softwoods	48,934	30,834	9,917	--	8,183	210,382	129,382	44,376	--	36,624
Hardwoods	17,826	10,026	3,081	--	4,719	33,358	24,358	2,908	--	6,092
All species	66,760	40,860	12,998	--	12,902	243,740	153,740	47,284	--	42,716
Total S. Rocky Mt. States:										
Softwoods	176,732	100,932	28,253	1,326	46,221	735,785	439,785	116,075	5,049	174,876
Hardwoods	43,903	26,103	5,521	147	12,132	88,417	60,417	7,974	396	19,630
All species	220,635	127,035	33,774	1,473	58,353	824,202	500,202	124,049	5,445	194,506
Total All Rocky Mt. States:										
Softwoods	564,129	379,529	66,724	23,480	94,396	2,372,698	1,662,698	268,101	103,171	338,728
Hardwoods	48,605	27,305	6,709	501	14,090	102,284	63,284	11,594	1,836	25,570
All species	612,734	406,834	73,433	23,981	108,486	2,474,982	1,725,982	279,695	105,007	364,298

[1]International 1/4-inch rule.

Table 53.--OUTPUT OF ROUNDWOOD PRODUCTS FROM TIMBERLANDS IN THE ROCKY MOUNTAIN STATES BY SOFTWOODS, HARDWOODS, AND OWNER GROUP, 1970

State	All owner groups	National Forest	Other public	Forest industry	Other private
			Thousand cubic feet		
North. Rocky Mt. States:					
North Idaho					
Softwoods	236,132	121,136	26,683	58,088	30,225
Hardwoods	183	94	21	45	23
All species	236,315	121,230	26,704	58,133	30,248
South Idaho					
Softwoods	89,567	45,948	10,121	22,033	11,465
Hardwoods	70	36	8	17	9
All species	89,637	45,984	10,129	22,050	11,474
Western Montana					
Softwoods	248,588	111,119	15,413	85,763	36,293
Hardwoods	24	11	1	8	4
All species	248,612	111,130	15,414	85,771	36,297
Eastern Montana					
Softwoods	30,944	13,832	1,919	10,676	4,517
Hardwoods	3	1	--	1	1
All species	30,947	13,833	1,919	10,677	4,518
Western South Dakota					
Softwoods	15,124	12,281	1,573	106	1,164
Hardwoods	--	--	--	--	--
All species	15,124	12,281	1,573	106	1,164
Wyoming					
Softwoods	33,685	30,923	1,954	--	808
Hardwoods	--	--	--	--	--
All species	33,685	30,923	1,954	--	808
Total Northern Rocky Mountain States					
Softwoods	654,040	335,239	57,663	176,666	84,472
Hardwoods	280	142	30	71	37
All species	654,320	335,381	57,693	176,737	84,509
South. Rocky Mt. States:					
Arizona					
Softwoods	86,986	64,109	22,703	174	--
Hardwoods	7,194	5,302	1,878	14	--
All species	94,180	69,411	24,581	188	--
Colorado					
Softwoods	52,257	47,606	1,829	314	2,508
Hardwoods	1,885	1,717	66	11	91
All species	54,142	49,323	1,895	325	2,599
Nevada					
Softwoods	572	121	351	--	100
Hardwoods	--	--	--	--	--
All species	572	121	351	--	100
New Mexico					
Softwoods	46,790	31,818	6,503	5,615	2,854
Hardwoods	802	545	112	96	49
All species	47,592	32,363	6,615	5,711	2,903
Utah					
Softwoods	11,955	10,209	311	--	1,435
Hardwoods	436	373	11	--	52
All species	12,391	10,582	322	--	1,487
Total Southern Rocky Mountain States					
Softwoods	198,560	153,863	31,697	6,103	6,897
Hardwoods	10,317	7,937	2,067	121	192
All species	208,877	161,800	33,764	6,224	7,089
Total all Rocky Mountain States					
Softwoods	852,600	489,102	89,360	182,769	91,369
Hardwoods	10,597	8,079	2,097	192	229
All species	863,197	497,181	91,457	182,961	91,598
Percent of total	100.0	57.6	10.6	21.2	10.6

Table 54.--REMOVALS FROM GROWING STOCK ON COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY ROUNDWOOD PRODUCTS, LOGGING RESIDUES, AND OTHER REMOVALS, 1970

State	Total removals	PRODUCTS										Logging residues	Other removals
		All products	Saw logs	Veneer logs	Pulpwood	Commercial poles	Mine timbers	Miscellaneous industrial wood[1]	Posts, fuelwood: miscellaneous farm timbers				
	Thousand cubic feet												
North. Rocky Mt. tates:													
North Idaho	259,010	229,416	191,445	25,021	8,370	2,208	1	2,130	241			26,956	2,638
South Idaho	98,244	87,020	72,617	9,491	3,174	838	1	808	91			10,224	1,000
Western Montana	292,043	248,379	210,787	32,072	1,460	720	1,640	573	1,127			39,142	4,522
Eastern Montana	32,361	26,926	26,239	--	182	90	204	71	140			4,872	563
Western . Dakota	15,651	14,887	7,334	--	5,294	594	--	163	1,502			581	183
Wyoming	36,153	32,244	31,947	--	--	10	101	103	83			2,469	1,440
Total Northern Rocky Mountain States	733,462	638,872	540,369	66,584	18,480	4,460	1,947	3,848	3,184			84,244	10,346
South. Rocky Mt. States:													
Arizona	87,744	78,633	[illegible]	--	[illegible]	273	293	131	138			8,551	560
Colorado	58,989	49,895	38,887	5,299	754	337	2,034	913	1,671			4,753	4,341
Nevada	10	--	—	--	--	--	--	--	--			--	10
New Mexico	44,086	38,986	38,901	--	--	--	82	--	3			4,739	361
Utah	12,741	11,471	10,792	--	--	20	250	407	2			823	447
Total Southern Rocky Mountain States	203,570	178,985	158,265	5,299	8,867	630	2,659	1,451	1,814			18,866	5,719
Total all Rocky Mountain States	937,032	817,857	698,634	71,883	27,347	5,090	4,606	5,299	4,998			103,110	16,065

[1]Includes house logs, converter poles, piling, shingle bolts, excelsior bolts, match stock, charcoal wood, and similar items.

Table 55.--REMOVALS FROM SAWTIMBER ON COMMERCIAL FOREST LAND IN THE ROCKY MOUNTAIN STATES BY ROUNDWOOD PRODUCTS, LOGGING RESIDUES, AND OTHER REMOVALS, 1970

State	Total removals	PRODUCTS										Logging residues	Other removals
		All products	Saw logs	Veneer logs	Pulpwood	Commercial poles	Mine timbers	Miscellaneous industrial wood[1]	Posts, fuelwood: miscellaneous farm timbers				
	[illegible] *International 1/4-inch rule*												
North. Rocky Mt. States:													
North Idaho	1,520,499	1,424,966	1,194,166	160,180	46,195	10,271	--	13,170	984			85,041	16,492
South Idaho	571,617	540,504	452,960	60,758	17,522	3,896	--	4,995	373			32,257	6,256
Western Montana	1,635,237	1,487,053	1,267,714	197,964	7,129	3,329	4,497	2,901	3,519			120,780	27,404
Eastern Montana	178,912	160,466	157,805	—	887	419	560	361	438			15,035	3,411
Western . Dakota	87,032	85,245	46,376	--	30,094	2,770	--	157	5,848			733	1,054
Wyoming	195,726	182,978	182,796	--	--	43	6	76	57			3,862	8,886
Total Northern Rocky Mountain States	4,202,423	3,881,212	3,301,817	418,902	101,827	20,724	5,063	21,660	11,219			257,708	63,503
South. Rocky Mt. tates:													
Arizona	493,541	466,824	441,937	--	22,154	1,278	772	369	314			23,394	3,323
Colorado	341,110	301,794	242,797	33,950	4,206	1,566	5,183	4,998	9,094			12,898	26,418
Nevada	63	--	--	--	--	--	--	--	--			--	63
New Mexico	262,096	244,293	244,223	--	--	--	57	4	9			15,544	2,259
Utah	69,724	65,272	64,563	--	--	89	616	2	2			1,780	2,672
Total Southern Rocky Mountain States	1,166,534	1,078,183	993,520	33,950	26,360	2,933	6,628	5,373	9,419			53,616	34,735
Total all Rocky Mountain States	5,368,957	4,959,395	4,295,337	452,852	128,187	23,657	11,691	27,033	20,638			311,324	98,238

[1]Includes house logs, converter poles, piling, shingle bolts, excelsior bolts, match stock, charcoal wood, and similar items.

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GREEN, ALAN W., and THEODORE S. SETZER
1974. The Rocky Mountain timber situation, 1970. USDA For. Serv. Resour. Bull. INT-10, 78 p., illus. (Intermountain Forest & Range Experiment Station, Ogden, Utah 84401.)

Presents highlights of the 1970 forest situation in the Rocky Mountain States. Describes the forest resource and the timber supply outlook; discusses some problems and opportunities for increasing timber output. Includes statistical tables: areas by land classes; ownership; growing stock volumes; net annual growth; mortality; roundwood products output; and logging residues.

OXFORD: 905
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OXFORD: 905
KEYWORDS: statistics (forest)

North. P

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Headquarters for the Intermountain Forest and Range Experiment Station are in Ogden, Utah. Field Research Work Units are maintained in:

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Missoula, Montana (in cooperation with University of Montana)
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Provo, Utah (in cooperation with Brigham Young University)
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A Descriptive Analysis Of Montana's Forest Resources

LAWSON UNIVERSITY
MAY 16 1975
SCI., TECH. & AGR. DIV.

USDA Forest Service Resource Bulletin INT-11, 1975
INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Ogden, Utah 84401

HIGHLIGHTS

Montana has 23 million acres of forest--one-fourth the total area of the State. Currently there is a widespread interest in the use and management of these lands. They play a significant role in the State's economy and their use greatly influences the environmental quality of much of the State.

There are several principal forest zones, based primarily on elevation. At the lower elevation is the ponderosa pine zone, where forage production for wildlife and livestock and easily accessible recreation are an important part of the forest land use. The Douglas-fir, cedar-hemlock, and spruce-fir zones occur at intermediate elevations. Larch, white pine, and lodgepole pine are other major species in these zones where commercial timber values are greatest. The subalpine spruce-fir, and alpine zones are at the higher elevations. Water yields are greatest here, and these high elevations provide summer grazing and highly scenic recreation opportunities.

About three-quarters of the forested land is federally owned and most of the rest is in private ownership. During the last 20 years, the total area of forest land has remained almost constant, but the acreage of the principal timber-producing standard commercial forest lands has decreased in favor of deferred, special, and marginal commercial forest lands and Wildernesses and Primitive Areas.

While all of the forest provides recreational opportunities, recreation is the principal use of at least 3 million acres. In addition to legally established areas, such as National Parks and Wildernesses, this area includes about 800 developed sites and more than 1,700 private recreation residences on leased public lands. Privately owned campgrounds have recently become rather common and a few large forest-oriented resort complexes are now being developed. Montanans are avid fishermen and hunters. In 1970, 22 percent of all State residents purchased big game licenses.

Recreational use of the forest has not been without problems. Congestion in popular areas has occasionally led to severe environmental problems and sometimes has made solitude a rare commodity, even in Wildernesses. There have been frequent conflicts among different kinds of recreationists--particularly over the use of recreation vehicles and the proliferation of subdivisions--and between recreationists and those harvesting timber.

Both grazing and the development of mineral resources also are occurring on forested lands. One estimate is that more than half of these lands could support cattle or sheep. Perhaps 400,000 acres are directly involved in active mineral claims. In addition, coal mining is rapidly expanding and there are several hundred oil and gas leases, principally in eastern Montana.

The timber harvest currently is about 1.2 billion board feet annually and is the most important economic use of the forest. About 11 percent of all personal income in Montana, and half of the personal income in western Montana, are directly or indirectly dependent upon wood products. A six percent change in the State's timber harvest might lead to an increase or decrease of about 900 jobs.

Nearly all major facilities of the wood products industry are owned by multi-State corporations with headquarters outside Montana. Three of the largest of these corporations--St. Regis, Burlington Northern, and U.S. Plywood--are also the major private owners of forest land. The major wood processing centers lie to the west of the Continental Divide with the largest concentrations at Troy, Libby, Kalispell, Columbia Falls, Missoula, and Bonner. In addition to lumber mills, these include five plywood and two particleboard plants and one papermill. Substantial increases in capacity for processing all of these products are underway or have been proposed.

There are a number of environmental problems associated both with the harvesting and with the processing of wood products. Timber harvesting and associated road construction have been modified over the years to protect and enhance the other forest resources. This has been most obvious in a heavier reliance on partial cutting and smaller size clearcutting units. There still exist some as yet unresolved problems in the protection of both air and water quality, but considerable progress has been made in the last few years.

Montana's timber is primarily an old-growth resource. Douglas-fir is currently the single most important commercial species but lodgepole pine is the most abundant. Other commercially important species include ponderosa pine, Engelmann spruce, western larch, and the true firs.

The extent to which Montana's forest lands will provide timber in the future hinges both on the extent of the land base that will be devoted to timber production and the quantities of wood harvested from that base. If all the New Study Areas currently under consideration for addition to the Wilderness system are permanently reserved from timber harvest, perhaps 45 million board feet of timber harvest annually will be foregone. The direct impact of reserving the other areas that are presently unroaded would be on the order of hundreds of millions of board feet of foregone timber harvest. The New Study Areas are not included in present allowable harvest plans; other roadless areas are. The flow of wood products from lands not reserved from harvesting depends upon a combination of the level of investments applied to the land, the development of harvesting techniques that can overcome economic, esthetic, and ecological constraints, and the ability to fully utilize the fiber resource that is produced.

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A DESCRIPTIVE ANALYSIS OF MONTANA'S FOREST RESOURCES

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PREFACE

Montana's total area is 93 million acres. Three-fourths of these acres are the wide open "Big Sky" spaces that have given rise to Montana's colorful history and image of cowboys, open range, brawling mining camps, and frontier hardships.

The other one-fourth of Montana is forest land--23 million acres in total. Although timber resources have been tapped for over 100 years--the first sawmill was established in 1842, and both Indians and early explorers relied on the forest for game and shelter--only in recent decades has the overall importance of the forest resources to the State been recognized.

This new perspective derives from the role that forest products harvest and manufacture now play in the economy of the State, and also a national interest in the preservation, environmental concerns, and conflict over forest land use.

In 1958, the Northern Region of the Forest Service, at the request of the Montana congressional delegation, prepared a report "Full Use and Development of Timber Resources in Montana" (USDA Forest Service 1958). This report discussed the timber resource and its potential utilization and industrial development. The report was printed as Senate Document No. 9, January 27, 1959.

This present analysis updates the 1959 report and expands its scope and content to include data on employment, income, and economics. In addition, many amenity values have taken on critical importance in forest land use and management, and these are presented in an analytical framework to the extent possible with available data.

The Intermountain Forest and Range Experiment Station was assigned the principal task of assembling data and preparing the report. The Northern Region provided detailed resource and harvest data and critical review throughout the writing of the report. Montana State University at Bozeman developed parts of the economic and employment analysis, primarily through its 1967 input-output model of the State's economy.

Many other agencies and individuals have also provided data and helpful comments for this report. These include the Bureau of Indian Affairs, Billings; the Bureau of Land Management, Billings; the Montana Department of Natural Resources, Division of Forestry, Missoula; and the Planning and Economic Development division of the Montana Department of Intergovernmental Relations at Helena.

Much of the forest land in Montana is public land, and therefore much of the data and discussion relates to forest resource activities of various agencies. However, the focal point of the analysis is the forest resource, inclusive of all ownerships. It is not our intent to deal with all public lands, or with public land management agencies, as such, but rather with the forest resource. For example, in discussing minerals our primary concern is mining that affects forest resources, and we have not attempted to include a discussion of the total mineral resource.

As is often the case in developing such a wide-ranging report, more data would have been desirable. But two conclusions stand out that would be altered only slightly, if at all, by more refined information.

Montana no longer has a large surplus of timber awaiting a market. There is sharp competition for currently available wood supplies. The economic values of the timber resource are important to Montana and are critical to many individual communities, especially in western Montana. But the vitality of the industry is directly dependent upon national economic conditions and national markets that are beyond the State's control.

Concerns for the manner in which all the resources of the forest are used have been effectively expressed by a variety of interests. Differences in opinion over forest land use are forcing the clearer definition of alternatives for reaching both commodity and noncommodity objectives. Hopefully, this report will help define those alternatives.

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CHAPTER I

THE FOREST RESOURCE [1]

In all but the most recent of the many reports and summaries on Montana's forest lands that have been compiled over the years, the production of commercial timber products has been the dominant concern (Hutchison 1957; Herrington 1959; USDA Forest Service 1958; Bolle and others 1966; Wilson and Spencer 1967; Hutchison and Kemp 1952; Nelson 1963). Now, however, forest lands are viewed as producing many products, uses, and values--some of them intangible and difficult to measure. This section describes and quantifies the forest resources and the uses and activities related to them.

The Forest Land Base

Montana's forests change greatly in character in short distances because of the mountainous terrain. Five major climax forest zones have been identified based on the predominant tree species. Beginning at the lowest elevation, the zones are the ponderosa pine zone, the Douglas-fir zone, the grand fir and cedar-hemlock zone, the spruce-fir zone, and the subalpine zone. The relative elevations of these zones shown in figure 1 is typical for west-central Montana. In northwest Montana zone elevations would be somewhat lower and in southern and eastern Montana somewhat higher.

How these climax zones relate to various resource values is shown in figure 2. For example, among the five zones, highest timber values occur in the cedar-hemlock zone. (This is not to imply that timber values are higher than other resource values in the cedar-hemlock zone.)

The ponderosa pine climax zone (fig. 3) begins at the edge of low-elevation grasslands as scattered trees or sparse, parklike stands. This zone is too dry for any other commercially important conifers. Undergrowth may be grasses on the drier sites or shrubs under more moist conditions. This zone, which is extensive to the east but quite limited in extent to the west of the Continental Divide, has only low water and timber yields; it is intensively used for recreation and as a producer of forage for cattle and wildlife.

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[1]Statistical data in this section have been derived from a number of sources. The most comprehensive single source is "The Outlook for Timber in the United States" (USDA Forest Service 1973a). These data are used for most of the report. However, data from reports of individual agencies may differ due to differences in definitions, statistical errors, and actual forest land changes over time. No attempt is made here to reconcile such differences, but sources of the data are specified.

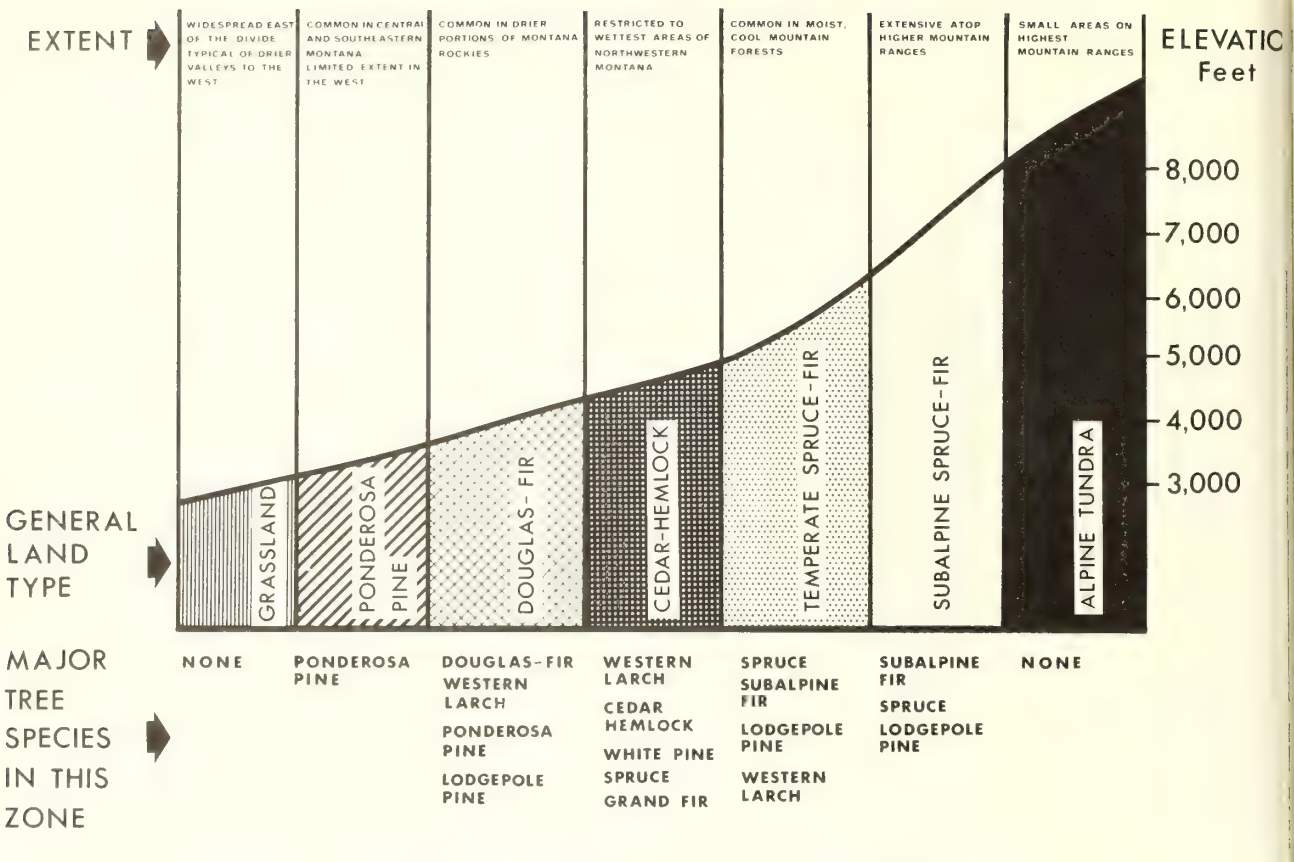

Figure 1.--Forest zones of Montana

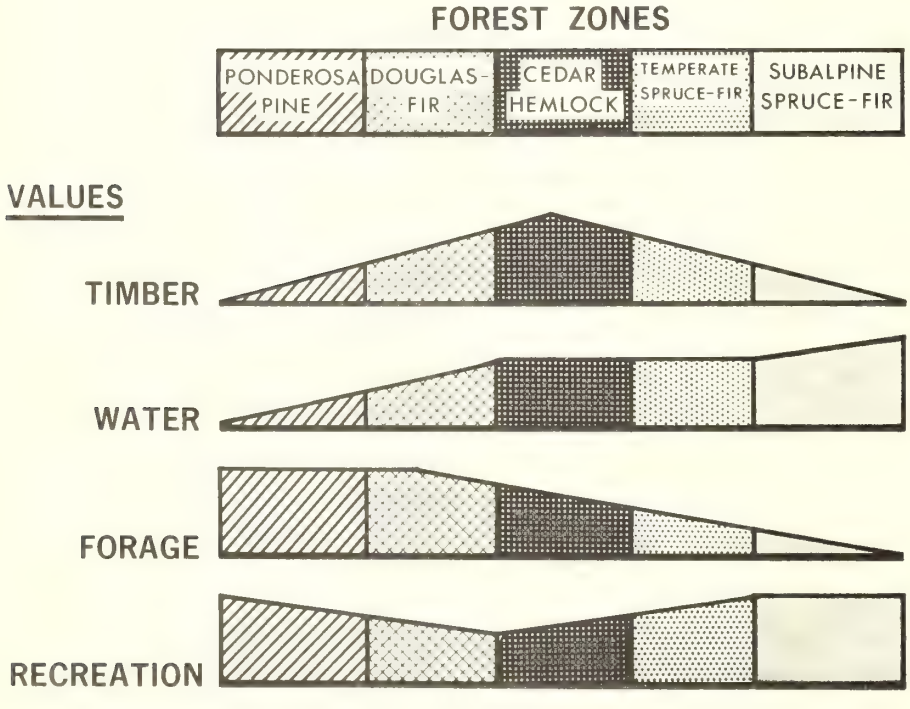

Figure 2.--Distribution of timber, water, forage, and recreation values by forest zones of Montana.

Figure 3.--Ponderosa pine stand on Custer National Forest in eastern Montana.

In the Douglas-fir climax zone, (fig. 4) stands grow moderately fast, are dense, and produce the most important commercial species in Montana: Douglas-fir, often mixed with ponderosa pine, western larch, or lodgepole pine. This zone occupies a large portion of the forested areas in the Montana Rocky Mountains.

The grand fir and cedar-hemlock climax zone, (fig. 5) the most productive forest land, with many moisture-loving species in the understory, is restricted to the northwest corner of the State. In the more moist and least disturbed areas of this zone, the climax species cedar and hemlock predominate. However, where disturbed by wildfire much of this forest zone is presently occupied by western larch, western white pine, and spruce. A mixture of species is common in this zone, but total acreage of the zone is small.

The temperate spruce-fir zone (fig. 6) is also relatively productive. In the moistest portions, such as stream bottoms and poorly drained benches at moderate elevations, spruce is the only successful conifer. In other areas, subalpine fir is the probable climax species and lodgepole pine or western larch may be the dominant overstory trees.

Figure 4.--Douglas-fir stand on Helena National Forest.

Figure 5.--Giant cedars with luxuriant undergrowth in northwestern Montana.

Figure 6.--Spruce-fir forest on the Montana-Idaho border.

The subalpine zone is the highest and forms the upper timberline. In this cold, snowy environment little timber or cattle forage is produced, but the zone yields high amounts of water and wildlife food and cover and is highly prized for recreation.

In each of these broad zones, there are many habitat types that have unique combinations of understory vegetation. The habitat types are providing an increasingly refined basis for evaluating land capacity for wildlife, water, recreation, timber, and other uses.

Montana's forest lands vary from scattered bottomland stringers of cottonwood in the eastern portions of the State to large, dense stands of pine, fir, and other coniferous species on mountain slopes in the western portion. Forests are more dominant west of the Continental Divide, where they cover 80 percent of the total land area, as compared with east of the Divide, where forests cover 12 percent of the land (fig. 7).

Ownership is of particular significance in analyzing Montana's forest resource because there are some striking differences in laws, policies, and management objectives among various forest owners. The Federal Government manages about 17 million acres of Montana's forest land. Another 5.7 to 7.3 million acres (depending on the definition of "forest land") is in private and

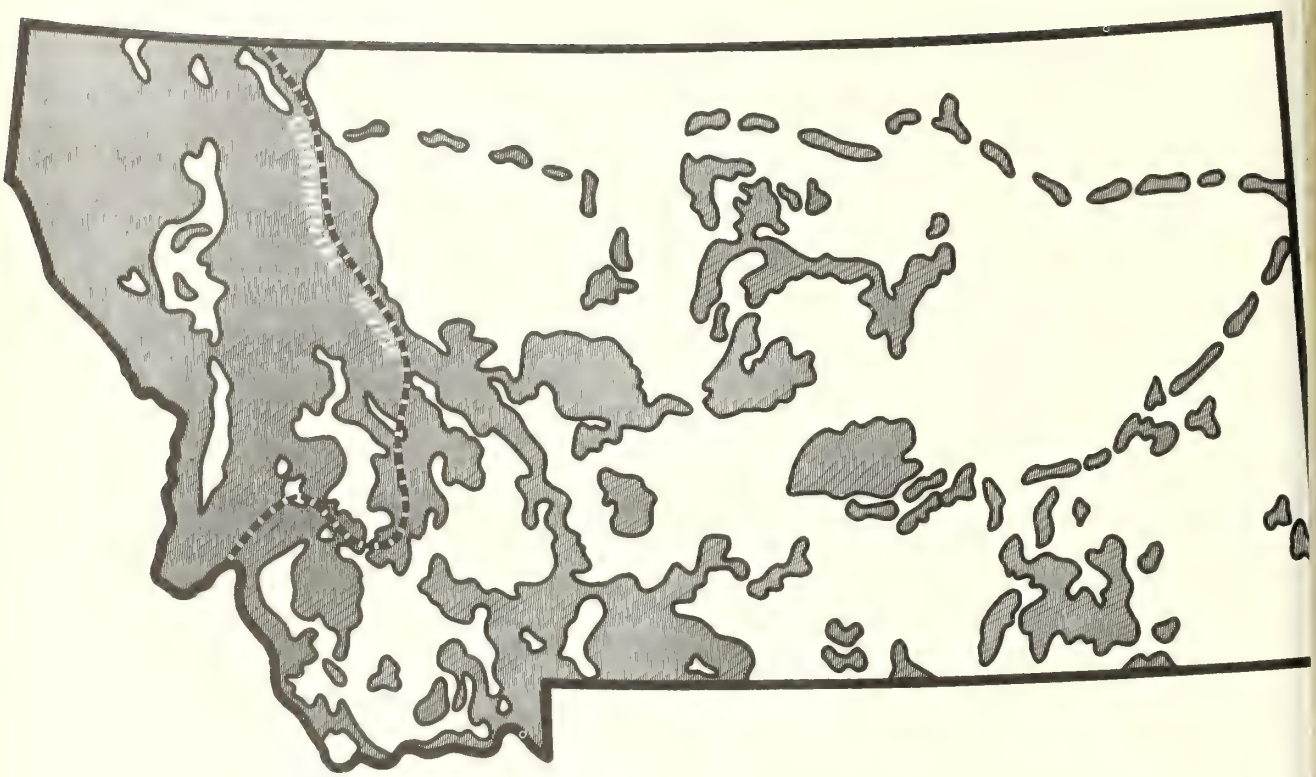

Figure 7.--Forested land in Montana.

State ownerships. The approximate ownership pattern (USDA Forest Service 1973a) for forest lands is:

	Thousand acres	*Percent*
National Forests	16,526.7	72.6
Bureau of Land Management	478.0	2.1
Miscellaneous Federal	53.1	.2
Total Federal	17,057.8	74.9
Indian (including land held in trust by BIA)	620.2	2.7
State	529.5	2.3
County and municipal	4.7	--
Forest industry	1,055.4	4.6
Farmer	1,952.4	8.6
Other private	1,557.6	6.8
Total Non-Federal	5,719.8	25.1
All forest land	22,777.8	100.0

The ownership pattern of Montana's forest lands has changed over the years as public lands have been acquired, sold, or exchanged and as private lands have changed hands. Changes have occurred as environmental concerns have grown and as utilization technology has changed. The most significant change, however, has been how land is classified through legislative action and administrative regulations. Total acreage of forest land has remained fairly constant, but Wilderness and Primitive Areas, and acreages of deferred, special, and marginal commercial forest have increased, while acreage of the principal timber-producing standard commercial forest land has decreased. Over time, the categorization of Montana's forest lands changed in the following manner:

	1949	*1963*	*1970*
	(Million acres)		
Standard commercial	15.8	16.8	12.5
Special, deferred, marginal	--	.1	3.4
National Parks, Wilderness, Primitive	2.4	2.3	2.9
Noncommercial	4.2	3.8	4.0
Total	22.4	23.0	22.8

(Sources: USDA Forest Service 1973a; Regional Office data; Hutchison and Kemp 1952)

National Forests are the largest single ownership of forest land in Montana, totaling over 16 million acres. A critical look at land capabilities has led to new definitions of commercial forest land, and some roadless areas have been identified for study as to their potential for inclusion in the National Wilderness Preservation System. At the end of 1973, when less than one-seventh of the scheduled land-use planning had been completed, approximately 36 percent of National Forest land was considered "standard commercial forest land," ready, available, and suitable for normal timber production, using standard harvesting practices and precautions. The status of National Forest lands in 1973 was as follows:

	Million acres	*Percent*
COMMERCIAL FOREST LAND		
Standard (available and suitable for timber production with present technology)	6.0	36.4
Special (needs special timber production measures to protect other multiple use values)	.4	2.6

(Con. next page)

	Million acres	*Percent*
COMMERCIAL FOREST LAND		
Marginal (areas not presently scheduled for harvest because of excessive development costs, low product values, or resource protection constraints)	2.5	15.2
Deferred (includes 0.5 million acres of New Wilderness Study Area, plus 0.3 million acres previously deferred)	.8	4.8
Subtotal commercial	9.7	59.0
NONCOMMERCIAL AND MISCELLANEOUS	4.9	29.5
WILDERNESS	1.5	9.0
PRIMITIVE	.4	2.5
Total	16.5	100.0

(Source: USDA Forest Service 1973a and Regional Office data)

The Bureau of Land Management manages more than 8 million acres in Montana. This includes 827,000 acres of forest or wooded land, of which about 40 percent is commercial forest land (USDI Bureau of Land Management 1972):

	Acres
Commercial forest	334,000
Woodland	493,000
	827,000
Non-Forest	7,319,300
Total public lands administered by BLM	8,146,300

New criteria and guidelines together with updated resource information are continually modifying the use patterns of these BLM public lands; for example, two primitive areas, one geologic area, and a refuge area for wild horses have been established.

The Bureau of Indian Affairs administers over 620,000 acres of forest land. Over 70 percent of this is on the Flathead Reservation in western Montana, and the remaining forest lands are on the Crow, Northern Cheyenne, Blackfeet, and Rocky Boy reservations.

Montana's two National Parks--Glacier and a portion of Yellowstone--include nearly 1 million acres of forest land that is reserved from commercial timber production. These components of Montana's forest land play a major role in the recreation industry, and also influence the management and use of adjacent forest lands. These impacts are discussed in more detail in a later section.

The State of Montana owns about one-half million acres of forest, administered by the Division of Forestry, Department of Natural Resources. Most of the State forest land is at the lower or middle elevations and much has been logged.

Burlington Northern, Inc.; U.S. Plywood, a division of Champion International; and St. Regis Company account for three-fourths of the private forest land. Remaining forest land is in holdings ranging from smaller industrial holdings of several thousand acres, to small woodlots of a few acres. Private lands are mostly at lower elevations, are readily accessible, and most have been previously logged.

The Wilderness Resource

In 1964, the National Wilderness Preservation System was established to preserve undeveloped Federal lands. Each Wilderness area was to have the following characteristics:

(1) Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;

(2) Has outstanding opportunities for solitude or a primitive and unconfined type of recreation;

(3) Has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and

(4) May also contain ecological, geological, and other features of scientific, educational, scenic, or historical value.

By 1974, six areas in Montana had been legally designated as Wilderness. Another four areas had been administratively classified as Primitive Areas, to be managed essentially as Wilderness. The 10 areas encompass more than 2 million acres.

All National Forest areas that are roadless and at least 5,000 acres in size have been identified. Of these 4.9 million acres, 1.6 million acres have been identified as New Study Areas slated for intensive evaluations as future additions to the National Wilderness Preservation System. Although the areas

under study include about 500,000 acres of commercial forest land, all timber harvesting has been deferred until the detailed studies have been completed. Portions of National Forests classified as Wildernesses and Primitive Areas, and the New Study Areas are shown in figure 8. Timber harvesting has not been formally deferred on the other roadless areas, but none will occur until after the completion of management plans and the filing of Environmental Impact Statements with the Council on Environmental Quality.

The Wildernesses and Primitive Areas in Montana include some of the most spectacular scenery in the mountain West and provide excellent hiking, fishing and hunting (fig. 9). In addition, the areas provide natural laboratories for observing and studying plant and animal communities undisturbed by human development and are important watersheds. Mining is still permitted under regulations more stringent than in the past.

The Natural Area Resource

Throughout the Nation, Natural Areas are being established to provide areas where man's disturbance is minimized and to allow natural processes to dominate. Ecosystem conditions are preserved and scientific and educational use is encouraged. Unlike restricted-use lands such as parks, game refuges, or Wildernesses, recreational use and commercial use of Natural Areas are generally prohibited.

A Montana Natural Areas Committee, representing public and private groups concerned with land management, was formed in 1973 to coordinate Natural Area establishment. This committee through its various working groups defined Natural Areas as "areas of land or water representing significant natural features or processes, which are designated for their scientific and educational values."

To date, five Research Natural Areas have been formally designated on Federal lands in Montana:

	Acres
Coram Research Natural Area (Flathead N.F.)	635
Cliff Lake Research Natural Area (Beaverhead N.F. portion)	2,301
Cottonwood Creek Research Natural Area (Beaverhead N.F.)	128
Poker Jim Research Natural Area (Custer N.F.)	363
Sheep Mountain Research Natural Area (Red Rock Lakes National Wildlife Refuge)	85

Portions of several other special use areas have been designated as potential future natural areas.

The Montana Natural Areas Act of 1974 has provided special emphasis for including State-owned lands in the Natural Area system. It also enables the State of Montana to develop a complete system of Natural Areas through cooperation with other agencies and private individuals.

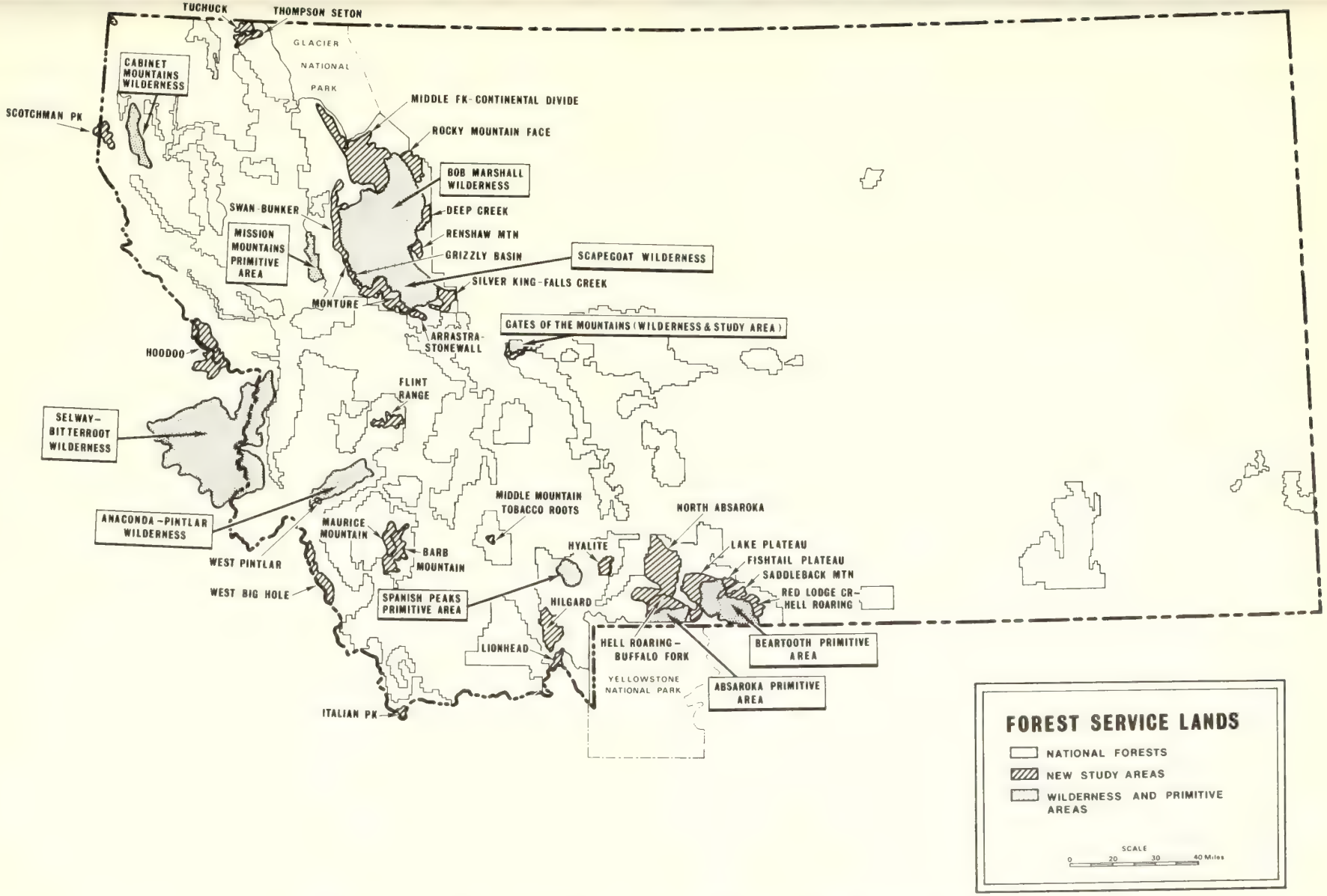

Figure 8.--Lands managed by the Forest Service in Montana.

Figure 9.--Hikers in Gates of the Mountains Wilderness on the Helena National Forest.

The existing Natural Areas and those that are established in the future will likely not be a large total acreage. But they potentially will serve a big role in providing benchmarks for comparison as more and more of the natural ecosystems on other forest lands are altered or disturbed.

The Recreation Resource

Outdoor recreation has become a major national pastime, and Montana forests offer millions of acres of prime recreation land. Defining forest land as a recreation resource is an elusive and subjective task, partly because it is often difficult to decide what portion of outdoor recreation should be attributed to the forest resource (Is boating in a mountain lake a forest recreation?), and partly because recreation use is not well documented. Then, too, forested lands support more than just the recreation sites and activities in or adjacent to forest lands. For example, many subdivisions for recreation and second homes wouldn't take place without the attraction of forest recreation opportunities and scenic forest backdrops.

"How big" is the forest recreation resource? It is as big and diverse as man perceives it to be. One view is that virtually all of the 23 million acres of forest land in Montana provide recreation, ranging from picnics in scattered groves at the edge of grasslands, to hunting in heavily timbered slopes, to

mountain climbing at timberline. At the other extreme, the forest recreation resource might be seen as about 3 million acres in Montana in which recreation is a major use. Much of this is in Wilderness and Primitive Areas and National Parks:

	Million acres (forest land)
Wildernesses and Primitive Areas	1.9
Glacier and Yellowstone (portion) National Parks	.9
Other campgrounds, recreation areas, etc. (estimated)	.2
	3.0

Another measure of the recreation resource is the developed sites that are available for forest recreation (or at least recreation within a forest setting). An accurate count is not available, but we estimate there are nearly 800 developed sites that are related to forest lands.[2] We categorized the sites as follows:

Campgrounds	505
Picnic areas	85
Boat-swim-fish access	60
Lodges and resorts	40
Winter sports	29
Other (scenic sites, nature displays, etc.)	55
	764

In addition, more than 1,700 private recreation residences are located on leased public forest lands. Residences on private forest lands would undoubtedly number in the thousands. For example, there are nearly 5,000 rural, nonfarm second homes in the State, and over 2,300 of these are in the 17 western-most forested counties. It would be reasonable to assume that many of these are used for forest-oriented recreation.

The number of public facilities on National Forests, National Parks, and other public lands hasn't changed much in recent years--for example, in National Forests, facilities other than private residences totaled 508 in 1965, as compared to 483 in 1971. This includes a net decrease in some types of camping and picnic facilities. However, total capacity (in terms of "persons at one time") has remained about the same. On the other hand, privately owned campgrounds have become much more common in the past decade, and construction or expansion of several large resort complexes is underway at areas like Big Sky (near Bozeman) and Big Mountain (near Whitefish).

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[2]Data for public lands were taken from internal reports. Data from private sites were developed from a commercial directory and from a Montana Fish and Game Commission report (1974).

Roads and trails are a vital part of the forest recreation resource. National Forests offer 17,000 miles of roads and 14,000 miles of trails, and the road system has increased steadily. Trail mileage has declined as roads and aircraft have reduced the need for trail access for management purposes, despite the rapid growth of recreation use. In other instances some roads and trails are closed for visitor safety and to protect the land resource. Mileages vary from year to year.

	Roads	*Trails*
	(Miles)	
1966	14,524	14,761
1967	14,923	14,680
1968	15,353	14,550
1969	15,767	14,191
1970	16,138	14,189
1971	16,677	14,241

Some roads and trails have been developed specifically to serve recreation purposes, but most of them were built more than three decades ago for timber harvesting, or management and protection.

The Grazing Resource

Forest land provides grazing for livestock, and thus contributes to agriculture, Montana's number one industry. There are about 65 million acres of grazing land in the State, about 11.5 million acres of it grazable woodland (USDA Forest Service 1973a):

	Private	*Public*	*Total*
	(Million acres)		
Grazable woodland	4.4	7.1	11.5
Rangeland	41.6	11.2	52.8
Total	46.0	18.3	64.3

A recent study of grazing suggests that more than half of the forested lands in Montana could support grazing without undesirable side effects (Forest-Range Task Force 1972). Summer grazing in the higher elevation forested lands complements the winter and spring grazing on lower elevation lands (fig. 10).

As in many agricultural activities, rangelands and grazing have become less important nationally as cattle raising has shifted away from extensive operations to more intensive ones such as feedlots (USDA Forest Service 1970). However, grazing in forest land for wildlife as well as domestic livestock remains locally important; management of forest grazing lands is certain to come under increasing concern for the environment and pressures for alternative uses of land. The demand for second homes in forest areas, as well as expansion of towns and residential areas, very often means lots and "ranchette of 1 to 20 acres being developed in the lower elevation fringe of the forest range resource. The land values that develop for this type use usually mean

Figure 10.--Cattle being counted onto National Forest range for summer grazing.

an end to grazing and a major change in the nature of the land. The Bitterroot Valley is a prime example of this type of development, where forested lands that are assessed at relatively low rates as timber and grazing areas are assuming residential property valuations.

In a few areas, especially on the Lewis & Clark National Forest, timber harvesting is apparently converting marginal commercial timberland to grazing land. But more commonly, forest-related grazing occurs in meadows that are administratively part of a forested area, and in some habitat types there is a natural encroachment of trees on meadows. Other grazing takes place during the early years of stand development. As the crowns close, forage production declines.

The Wildlife Resource

Nearly every forested acre of Montana provides habitat for some species of wildlife. Used in this context, wildlife is defined as "all wild vertebrate animals." Wildlife includes 540 species of mammals, birds, fish, reptiles, and amphibians in Montana (Davis 1965). Of this number of animals, almost all are dependent on the forest for existence. For example, the paddlefish in the lower Missouri and Yellowstone River systems is just as dependent on the quality and quantity of water produced in the forested headwaters as is the arctic grayling in the high mountain lakes and streams in southwestern Montana.

Forest lands in Montana offer as great a variety of big game as found in any State. The quality of game animals and hunting experiences available has brought the wildlife resource of Montana's forests national recognition.

A precise count of big game on all of Montana's forest lands is not available. Estimates of some of the principal game animals on National Forest lands and Bureau of Land Management lands, however, give some idea of their numbers. The following estimates include animals that are either highly dependent on forests for food and cover, or that are found primarily in areas managed as forest lands:

	NF	*BLM*
	(Thousand animals)	
Elk	54.1	35.7
Moose	5.1	.2
Whitetail deer	51.3	31.4
Mule deer	172.5	93.3
Grizzly bear	.5	--
Black bear	12.9	.7
Mountain goat	4.8	.3
Bighorn sheep	2.2	.4

(Source: National Forest and Bureau of Land Management annual reports)

Populations of big game fluctuate from year to year, but in general have held fairly constant over the past decade.

Game distribution maps generally show the mountainous and timbered areas of the State as producing the greatest variety of species. Generally, big game spend most of the year in forested areas until deep snow drives them to the lower elevation winter ranges (fig. 11). Portions of game ranges have been identified as critical for survival of certain species.

The Fish and Game Commission owns or leases 153,000 acres of big game range, most of it in the west and central portions of the State, to provide winter range for animals that summer in adjacent mountain forests. Farther east, in the upper Missouri River basin, about 40 percent of the area classed as forest and woodland is considered key game habitat (155,000 acres of key big game range and 55,000 acres of key upland game range).

Winter range has been the critical factor in deer and elk management; the forested summer range is generally abundant and therefore less critical. However, forest land management is of vital importance to wildlife because management decisions involving both winter range and summer range are usually

Figure 11.--This bull elk is part of a large herd that summers in Yellowstone Park and winters on the Gallatin National Forest.

nterdependent. In addition, timber harvesting and attendant roadbuilding raise important but as yet largely unanswered questions as to the net effect, positive or negative, on big game populations. Several studies on this impact are now underway, but until the results are available, decisions as to responses and trade-offs involving wildlife and other resources such as timber will be largely subjective.

There is a direct physical relationship between forest lands and fishing waters. Roadbuilding, timber harvesting, and similar activities can disrupt, at least temporarily, fishing waters through physical changes of streams, or through silting that affects spawning or food. Also, streams attract fishermen whose presence requires that parking and camping facilities be provided. An inventory on National Forests in Montana shows the following acquatic resource:

	NF land	*All lands*
Fish habitat:	13,032 miles (7,135 fishable)	15,000 miles
Lakes and impoundments:	128,400 acres (1,300 in number)	482,000 acres

The real value of wildlife that inhabit forest lands can only be told by the thousands of people who take to the woods for their fall hunt or who simply enjoy watching or photographing animals of all kinds in their native habitat. The numbers of people and dollars involved, however, do provide a useful measure of the role wildlife plays as a part of the forest resource. These are examined in more detail in a later section.

The Water Resource

Water has been called the most important product of the forest lands of the West. In Montana the forested mountains are the principal source of major streams. The Missouri and Yellowstone Rivers, which provide both hydroelectric power and irrigation water for much of the drier eastern part of the State, are fed by small streams originating in forested mountains. In the Columbia River drainage west of the Continental Divide, the water produced is used for irrigation and power generation.

Total water produced in Montana is about 37 million acre-feet per year. Perhaps half of this total comes from the National Forests, which lie at higher elevations. Other lower elevation forest lands do not receive as much precipitation, but all forest lands together probably yield two-thirds of the State's water.

Much of the water falls as snow. Ability to manipulate water yields through timber-harvesting practices and cloud seeding has been demonstrated for small areas but is still in the experimental stage for large basins. Water yields are most directly related to elevation, topography, and exposure to prevailing weather systems.

Managing the water resource also involves resolving several problems. Harvesting of timber can accelerate the spring runoff of the snowpack; therefore, the harvest within a given drainage must be planned to avoid floods. In addition, watershed damage resulting from earlier, poorly planned logging activities and from the large fires that occurred, particularly in the first half of this century, requires soil stabilization work (Packer 1959).

The Mineral Resource

Although minerals are not usually considered a forest resource, mining often has a big impact on forest cover and other forest resources. National Forests in Montana hold numerous mineral claims and leases. Recent changes in mining laws have increased Forest Service authority over the disposition of timber and protection of the environment on most of these claims.

In the eastern part of the State, mining has begun on parts of the vast coal reserves underlying about 800,000 acres. About 85 percent of this is cropland and pasture, and range, but some forested land and grazing lands administered by the Forest Service are involved (Coordinating Committee, North Central Power Study 1971). Various private interests, environmental groups, and landowners are currently debating the legal and environmental aspects of strip mining this coal.

The strip mining already underway and proposed expansions will have a substantial impact on forest resources. For example, in the Tongue River drainage of southeastern Montana (including Ashland, Birney, and Decker), a preliminary recommendation was made to permanently reserve from strip mining about 20 percent of the federally owned coal deposits because of unacceptable impacts on the values associated with water yields, grazing, and recreational activities. In addition, it was recognized that mining on the remaining lands would adversely affect these and other forest-related values (USDI Bureau of Land Management 1974).

An effort is underway to develop data and guidelines for the proposed mining activity through the federally supported program SEAM--Surface Environment and Mining. This multidisciplinary effort headquartered in Billings is leading the development of techniques to minimize impacts of strip mining on the land resource and to more satisfactorily rehabilitate disturbed areas.

Forestry Education

To develop the skilled manpower needed to manage forest resources, there is an active and diverse program of forestry education in Montana. The University of Montana at Missoula has graduated over 3,000 foresters, and the School of Forestry is now one of the largest schools in the University. In addition to traditional forestry subjects, land use, environment, and public administration receive major emphasis.

In addition, the Missoula Technical Center offers 1-year and 2-year technical forestry programs at post-high school level. In recent years enrollment has been about 50 students; several hundred students have graduated. Surveying, timber scaling and cruising, and similar technical activities are the primary focus of this program. Flathead Valley Community College in Kalispell also offers a similar technical program and in addition offers professional preforestry college courses.

CHAPTER II

TIMBER MANAGEMENT AND PRODUCTION

In this section we describe the timber resource, how it is managed, levels of timber harvesting, and possible changes in timber production.

The Commercial Timber Resource

One of the basic considerations of forest land as a timber resource base is its productivity--that is, its capacity to grow usable wood. Montana's forest lands have been classified for productive capacity, and although some land is highly productive, most is in the middle or lower end of the range of growth potential (USDA Forest Service 1973a):

Growth potential per acre per year (ft^3)	*Montana*	*Rocky Mtns.*	*Oregon and Washington*	*United States*
		(Percent)		
165 or more	2	2	15	3
120-165	9	6	21	8
85-120	25	14	20	23
50-85	30	25	36	39
20-50	34	53	8	27
	100	100	100	100

In productivity, Montana's forested land compares favorably with the Rocky Mountain region and the United States as a whole, but is far less productive than the forested lands in Oregon and Washington.

Although these figures provide a first approximation of the capacity to produce wood, they are not totally satisfactory for estimating what the land could produce under more intensive forest management. It has been estimated, for example, that with adequate funding intensive management could double the production of timber on National Forest lands (Green and Setzer 1974).

In the short run, the current inventory of merchantable timber is of greatest concern in defining what could be harvested. In 1970 there were over 33 billion cubic feet of timber, about half in sawlog-size materials:

Class of timber	*Volume (Billion Ft^3)*	*Percent*
Sawtimber trees (9 in + d.b.h.)		
Sawlog portion	17.8	54
Upper stem portion	1.8	5
Pole timber trees (5-8.9 in d.b.h.)	9.0	27
Subtotal growing stock	28.6	86
Rough and rotten trees	1.5	4
Salvable dead	3.0	9
Total	33.2	100

An examination of individual species (fig. 12) shows that most of the growing stock is in lodgepole pine and Douglas-fir. Of the two, Douglas-fir

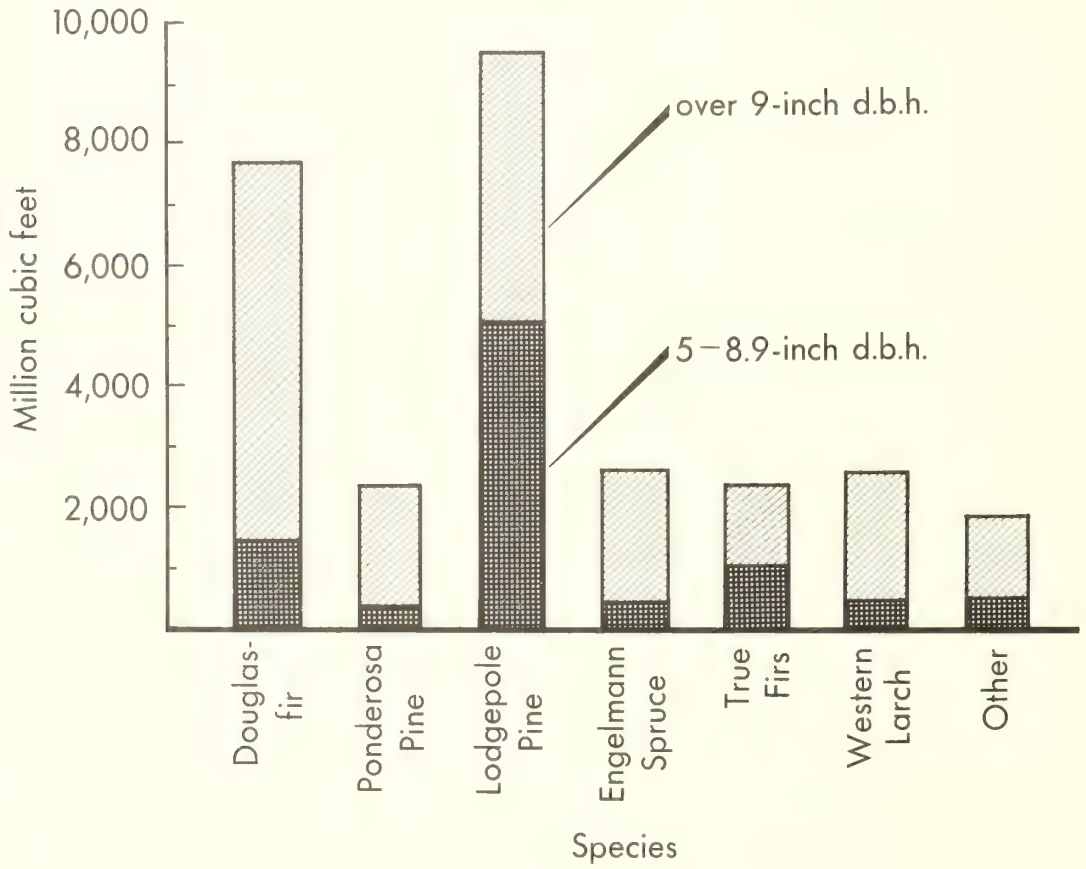

Figure 12.--Net volume of growing stock on commercial forest lands in Montana by species and size class, 1970. (From Green and Setzer 1974).

has been exploited far more heavily and is the State's most important commercial species. Most of the volume of all the principal species is in trees over 9-inches in diameter--Montana still is harvesting an old-growth resource.

Because of sampling errors and because the criteria defining commercial timber have changed, comparing inventories over time is difficult. However, available data indicate that the inventory in Montana of growing stock--all live (noncull) green trees expressed in cubic feet and sawtimber expressed in board feet of sawlogs--has remained relatively stable over the past two decades:

	All growing stock (Billion ft^3)	*Sawtimber (Billion bd. ft.)*
1953	27	101
1963	29	108
1970	29	102

(Source: USDA Forest Service 1973a).

From 1952 to 1970, growth rates and mortality of all growing stock remained about the same; net growth was about 1.5 percent of growing stock volume. In these same years, removals doubled to more than 1 percent per year. Even with this increase in utilization, in 1970 total growing stock volume was still increasing by an estimated 0.5 percent per year.

The total wood grown in Montana's forests, especially that grown in young stands, far exceeds removals, as shown in figure 13. In 1970, net growth of all growing stock was 443 billion cubic feet and removals 324 billion cubic feet (USDA Forest Service 1973a).

The young growing stands make up a substantial part of the total timber resource. The commercial forest lands of Montana include about 4.5 million acres of pole-size stands and 1.8 million acres of seedling and sapling stands. The real significance of these stands lies in their relatively fast rates of growth and their potential for providing future harvests. Many thousands of acres have been satisfactorily regenerated following harvests or wildfires and, through stocking control and other management efforts, are making good growth. However, there are other acres in need of restocking, thinning, and other cultural efforts.

In older sawtimber stands, which are primarily mature and overmature, removals are slightly greater than growth. From the standpoint of timber production, this is generally desirable because in old stands timber mortality is high and the land produces less wood than it will when converted to younger and more vigorous forests. The growth and removal in sawtimber stands expressed in board feet is shown in figure 14. Sawtimber removals exceed growth primarily on forest industry lands. On public lands sawtimber growth and removals are about equal.

Despite increased harvest, losses of sawtimber to mortality--insects, disease, and fire--are substantial. Mortality has been estimated at about 0.6 billion board feet annually (Green and Setzer 1974).

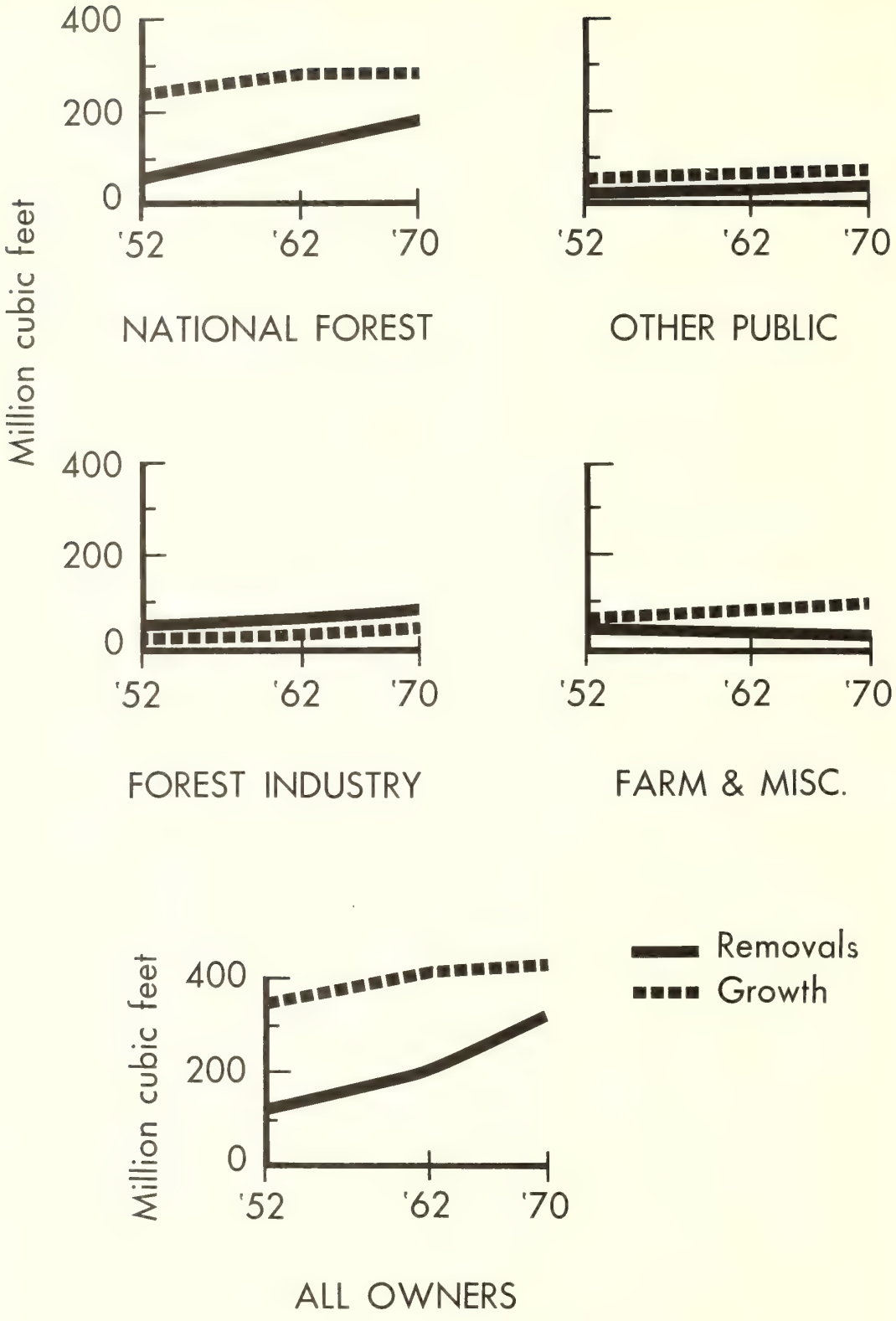

Figure 13.--Net annual growth and removals of growing stock in Montana by ownership.

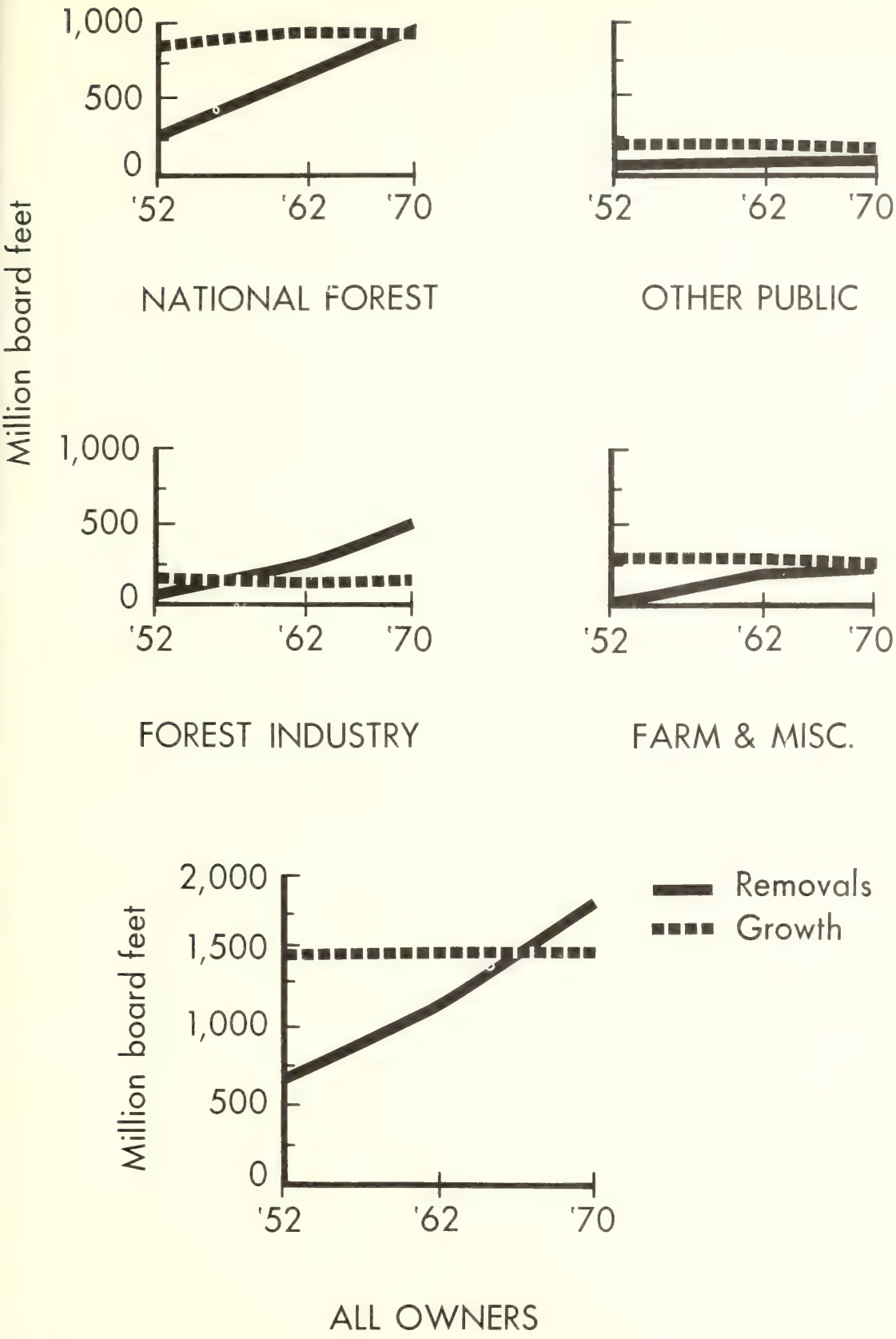

Figure 14.--Net annual growth and removals of sawtimber in Montana by ownership.

The Role of Insects

Several species of forest insects have had, and continue to have, a substantial impact on the forest resources of Montana (fig. 15). Outbreaks of some species of insects are long lasting while others are more transient and localized. Some species cause loss of growth and potential volume; others are outright tree killers. Major insect pests can be categorized either as defoliators or as bark beetles that attack the cambium.

The western spruce budworm probably has had the greatest impact on the forest resource of all species of either the defoliators or the beetles. The budworm has been in epidemic status on more than 5 million acres in Montana since the early 1950's, both east of the Divide in predominantly Douglas-fir forests, and west of the Divide in mixed stands.

Spruce budworm larvae are responsible for serious defoliation and top killing in several commercially important Montana conifers, including Douglas-fir, Engelmann spruce, grand fir, and subalpine fir. Many cutover areas remain nonstocked or require artificial stocking because budworm damage is disrupting the production of cones and seeds. Seed for regeneration is the most immediate budworm-related problem on several forests. In young larch, damage by budworm larvae has reduced annual net height growth by about 25 to 30 percent (Schmidt and Fellin 1973). In one area in the Flathead Valley, between 1967 and 1972 nearly all of the grand fir and subalpine fir and 14 percent of the Douglas-fir were top killed. Budworm defoliation and top killing have also been responsible for significant losses in Christmas tree production and sales.

The larch casebearer, an introduced pest, was discovered in Idaho in 1957 and now is distributed throughout the range of western larch in Montana. Limited studies show that severe damage can cause 75 to 95 percent reduction in growth, although larch can withstand being severely defoliated for several years before dying. The larch casebearer outbreak shows no signs of subsiding in western Montana.

Although the Douglas-fir tussock moth has been of great concern in the Pacific Northwest in recent years, a relatively few acres have yet been found to be infested in the Clark Fork and Flathead River drainages in western Montana. Douglas-fir tussock moths can completely defoliate trees in a single year because the larvae feed on foliage of all ages. Compared to the western spruce budworm and the larch casebearer, the tussock moth is truly a cyclic insect.

In western Montana, the pine butterfly has recently been of considerable concern and has severely defoliated ponderosa pine in some areas. Though the greatest impact has been in the Bitterroot Valley, infestations have been reported throughout the range of ponderosa pine in western Montana. No impact on ponderosa pine stands in central and southeastern Montana has been detected.

Although four insect species have had the greatest impact on the Montana forest resource, several other defoliating species (sawflies on pines, loopers on Douglas-fir and hemlock, needle miners in lodgepole, etc.) cause serious defoliation and growth losses in localized areas from time to time.

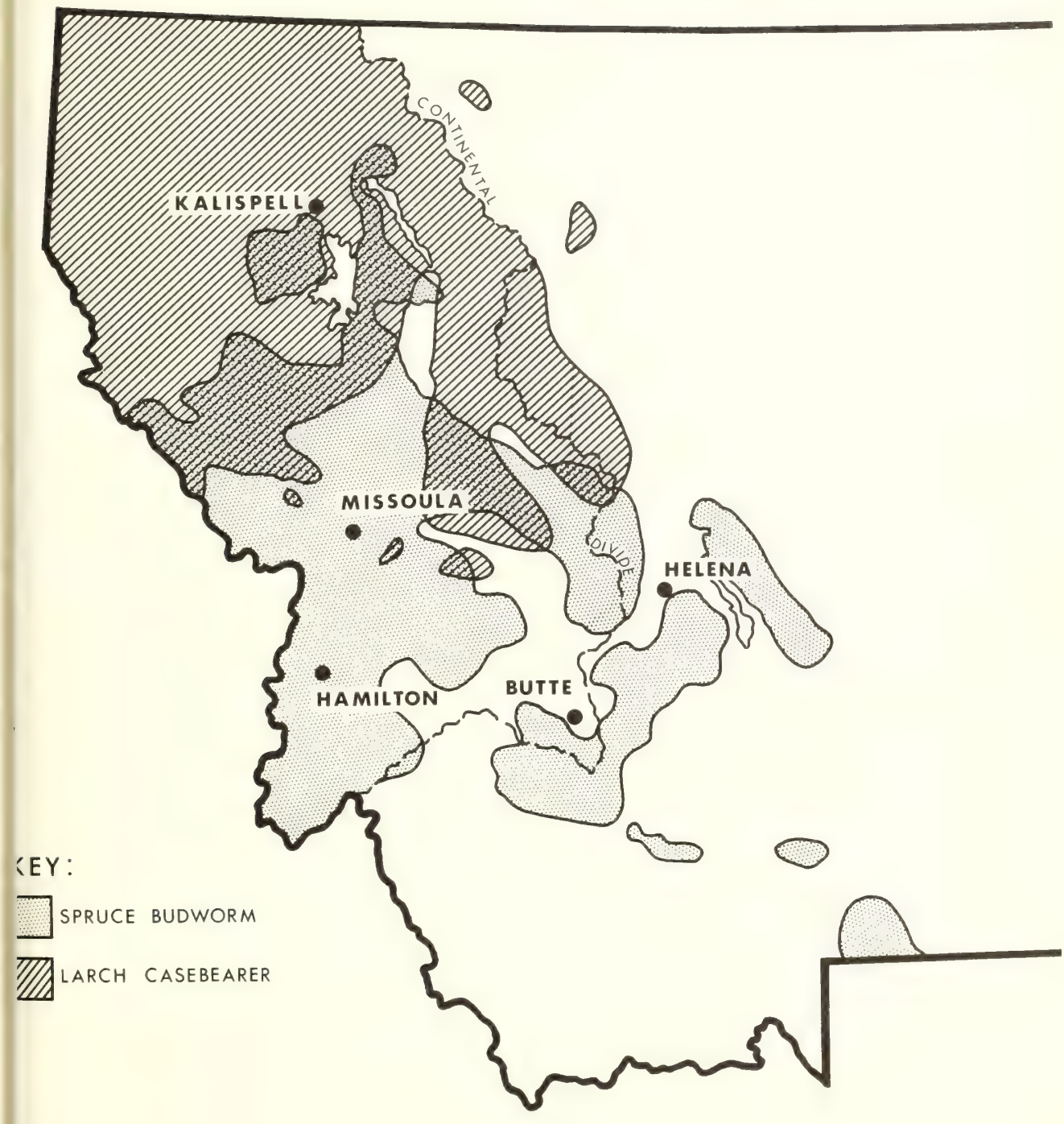

Figure 15.--Distribution of the two most damaging forest insects in Montana.

Among the insect pests classified as borers, the mountain pine beetle, a native insect, has long infested lodgepole, ponderosa, and white pine stands in the Northern Rockies. Most recently, outbreaks have developed in second-growth ponderosa pine stands at many locations in western Montana, resulting in the death of hundreds of young trees (McGregor and Williams 1974). At present there are epidemic infestations of this beetle on the Gallatin, Lewis & Clark, Kootenai, Helena, and Lolo National Forests, and in both Glacier and Yellowstone National Parks. Indications are that this insect will continue to affect the forest resource of Montana.

Not nearly as widespread nor with as great an impact to the forest resource as the mountain beetle in Montana, the Douglas-fir beetle continues to kill tree in relatively small areas at scattered locations in western Montana Douglas-fir stands. At this time, Douglas-fir beetle activity is confined to tributaries of the Clark Fork River drainage east of Missoula and the East Fork of the Bitterroot River.

Pine engraver beetle outbreaks are chronic but usually localized and transient. Recently pine engravers have been a problem in the Clark Fork River drainage and several thousand ponderosa pines have been killed on the Flathead National Forest. Pine engravers have top killed many ponderosa pine on many forests in western Montana. Fir engraver outbreaks in Douglas-fir have been very localized, the most recent on the Helena National Forest.

As harvesting converts mature forests into stands of young trees, insect problems and impacts on the forest resource have changed markedly. In the future, one of the major areas of concern will be in young stands and in areas of regeneration.

During the 1950's, thousands of acres of Engelmann spruce were clearcut to salvage trees killed by the Engelmann spruce beetle. The cutover areas have regenerated naturally or have been planted to spruce. By the early 1970's, the Engelmann spruce weevil, an insect that injures and kills terminal shoots of young trees, was found throughout these young spruce stands in western Montana. In many areas, repeated weevil attacks have killed trees outright or predisposed them to attacks by other insects (McGregor and Quarles 1971).

In west-central Montana, thousands of acres of overstocked lodgepole pine stands are being thinned annually. For the past 10 years, crop trees in these thinned areas have been defoliated by a small weevil. The weevil does not bother mature lodgepole pine--nor does it defoliate trees in nonthinned areas (Fellin 1973). These are two examples of forest insect problems changing with the conversion of mature stands to young trees, and we can expect others.

The Role of Diseases

Forest diseases probably reduce average timber growth in Montana from 8 to 10 percent annually (adapted from Childs and Shea 1967). The diseases responsible for this loss can be broadly categorized, in order of importance, as heart rots, dwarf mistletoes, root rots, canker diseases and foliage diseases. Particularly in lodgepole pine and Douglas-fir stands in the southwestern part of the State, the damage caused by dwarf mistletoes far exceeds that caused by

Figure 16.--Thinned stand of 15-year-old lodgepole pine on the Gallatin National Forest. Complete removal of old stand was necessary to insure new stand would be free of dwarf mistletoe.

all other disease agents. To control dwarf mistletoe, the infested stand must be clearcut and replaced by a new stand (fig. 16).

As second-growth management becomes more widespread, losses to dwarf mistletoes will be sharply reduced, but other diseases will become far more prominent. Diseases that begin in wounds or in fresh stumps, such as many heart and root rots, will become more prominent. The root-decay fungus *Fomes annosus* will undoubtedly be among the most important. In addition, many foliage and stem-canker diseases will become more damaging, especially where single-species management is practiced.

The Role of Fire

Nearly all of the wild forest stands in Montana were propagated or have been greatly modified by fires. Natural fires have occurred on forested lands on the average of about once every 150 years (Roe and others 1971). The commercially valuable trees and many other plant and animal species now native to the State are those that thrive under periodic fires.

Ecological adaptations to fire found in timber species include: (1) serotiny of lodgepole pine cones--heat of fire opens closed cones and releases

seeds; (2) thick, fire-resistant bark that permits trees such as western larch to survive fires long enough to cast their seed on the burned area; and (3) light, wind-disseminated seed of western larch and Engelmann spruce that can blow considerable distances.

The important timber species in Montana most favored by fire are western larch and lodgepole pine. On particular sites (where they are seral), fire also favors ponderosa pine, Douglas-fir, grand fir, and Engelmann spruce. Generally, these species do best when their seedbeds are free from competition and the duff has been burned away to expose a mineral soil seedbed. Controlled fires are used in combination with appropriate harvesting systems to create such conditions.

By and large, even intense fires do little physical or biological damage to the soil itself. For several years following fire, release of nutrients is accelerated, populations of beneficial bacteria and actinomycetes increase, and harmful fungal populations decrease--all changes that benefit timber production. Under severe conditions, burning of the forest floor vegetation may lead to increased, short-term overland water flows and soil erosion.

Generally, fires benefit wildlife. For a number of years after burning, forbs, grasses, and shrubs thrive; food and cover are abundant until the trees once again occupy the site (fig. 17).

Wildfires still have an important role to play in perpetuating the fire-adapted ecosystems now present. To this end, the Forest Service has established a "let-burn" area on the Bitterroot National Forest to gather data on the impacts of fire.

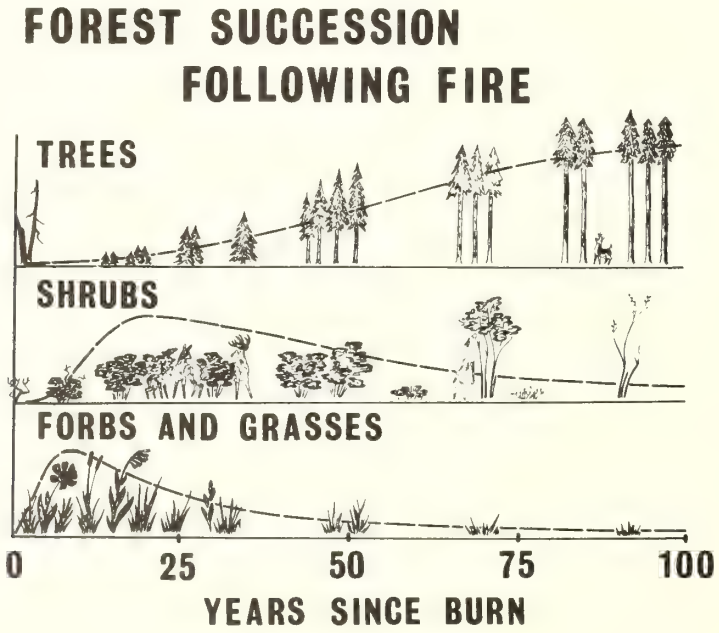

Figure 17.--Forest succession following fire.

Timber Harvest Levels

The modern era of timber harvesting began after World War II when the industry expanded to meet pent-up housing demands. During the past two decades, product makeup has changed. Use of wood for fuel and miscellaneous products has declined, sawlog output has increased, and plywood, pulp and paper, and particleboard have been added to Montana's product mix. Since 1952, the total output of Montana roundwood products (all products except firewood) has more than doubled (fig. 18).

In the past 20 years, the annual removals from growing stock on Montana forests increased from just over 100 million cubic feet to nearly 300 million cubic feet. Sawlogs have been the most important segment of this harvest. During the past 20 years, Montana has gone from a sizable surplus of sawlogs to constant pressures to increase harvesting. From the viewpoint of increasing total timber output, accelerated harvesting has been generally desirable because mortality in old-growth stands is high and the increased harvesting has utilized some of this material before it deteriorated.

Total harvest in Montana has fluctuated from about 1.1 billion board feet to about 1.3 billion board feet in recent years (fig. 19). Most of the fluctuation has been on public lands, primarily on National Forest lands. National Forest harvests have averaged 85 to 90 percent of the total public land harvest, and one-half to two-thirds of the total harvest.

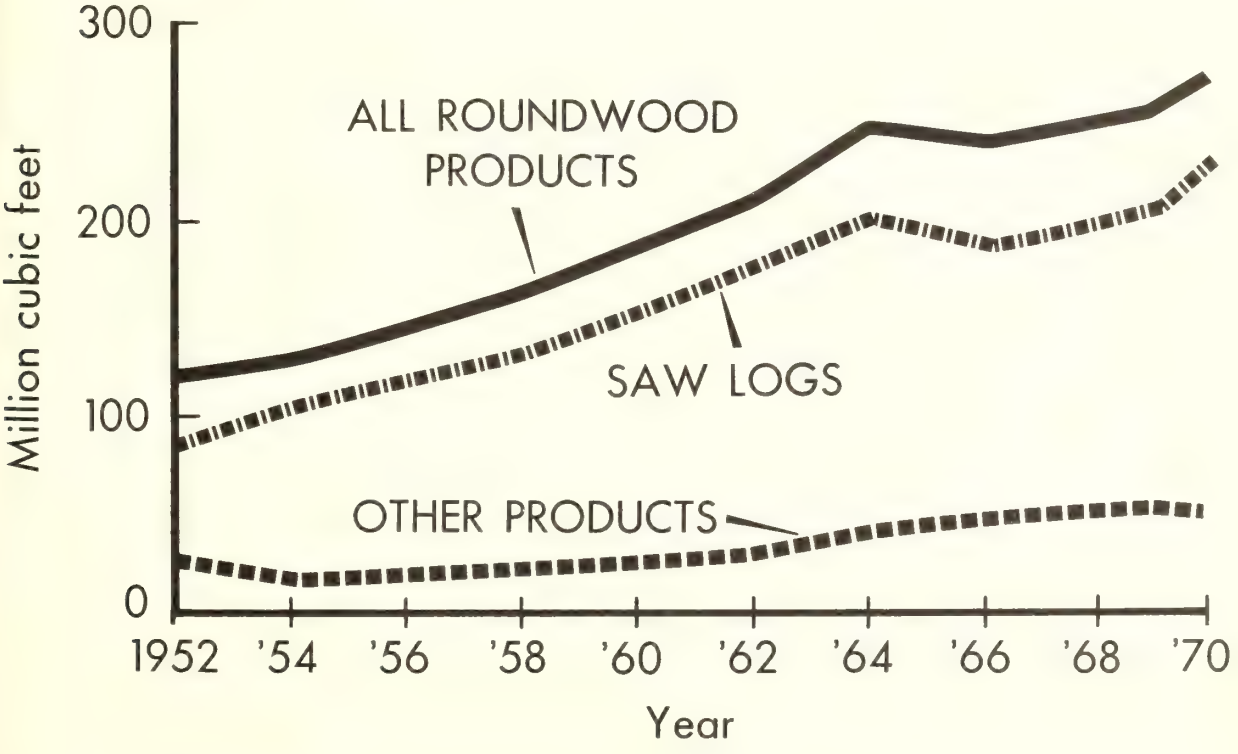

Figure 18.--Output of Montana roundwood products.

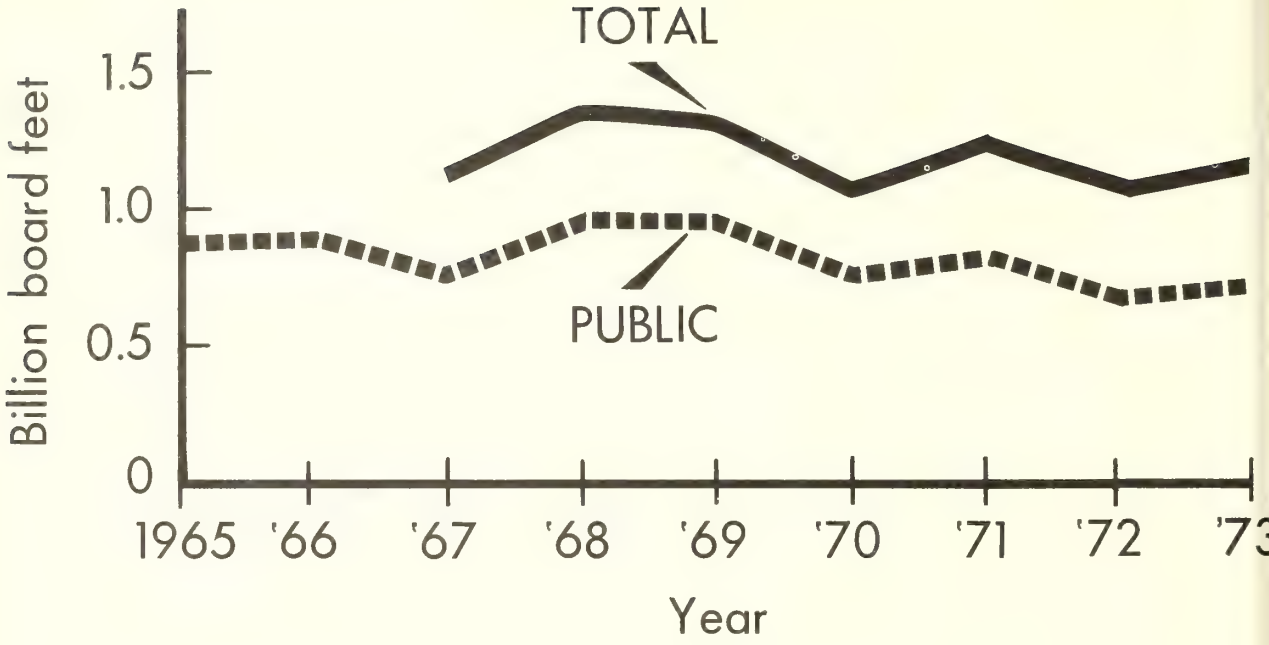

Figure 19.--Total harvest and public timber harvest in Montana.

On private lands, harvest climbed to 402 million board feet in 1971. Large industrial ownerships provide most of the harvest from private land. The year-to-year fluctuations in private harvests caused by changes in market conditions have not changed total harvest levels by very much.

In describing harvesting from Montana's forests, both the actual level of timber harvests and the calculated "allowable harvest" should be considered. The allowable harvest is a long-term planning tool that establishes rates of timber harvesting that will best meet objectives of particular owners. On public lands, one management objective is usually to develop forest stands with high rates of growth. For commercial forest lands stocked with old-growth timber characterized by low growth rates, the rate of cutting suggested by the calculated allowable harvest exceeds the growth of those stands. As more thrifty stands are established, though, forestwide average rates of growth and rates of cutting become nearly equal. The allowable harvest changes over time in response to the revision of timber management plans of individual management units. Recently, the allowable harvest and actual harvest for the four principal forest land managing agencies in the State have been as follows:

Managing agency	Allowable harvest	Actual harvest
	----(Million bd. ft.)----	
Bureau of Land Management		
1969	14	15
1970	14	12
1971	5	5
1972	4	4
1973	2	3
Bureau of Indian Affairs		
1969	90	79
1970	88	56
1971	90	76
1972	75	83
1973	97	98
State		
1969	35	47
1970	35	28
1971	35	22
1972	35	30
1973	35	23
Forest Service		
1969	829	800
1970	996	654
1971	970	739
1972	984	558
1973	969	567

Actual harvests have generally been less than the calculated allowable harvests because of adverse weather, strikes, fluctuations in the marketplace, lack of access, manpower and budget limitations, and so on. In addition, costs and related factors sometimes preclude harvest on marginal areas, even though the timber is theoretically available.

If actual harvests were increased to calculated allowable harvest levels on other than Forest Service lands, less than an additional 20 million board feet would be harvested annually. Major changes in harvest levels on these lands are not likely. Even a substantial increase would have only a small impact on State totals.

National Forest lands hold the principal influence on Montana sawlog harvest. Since 1962, annual allowable harvests have increased from about 750 million board feet to about 900 million board feet, largely because of changes in utilization standards. About 60 percent of this cut is planned for the Kootenai, Flathead, and Lolo National Forests in western Montana.

Actual harvest also increased on National Forests and peaked in 1969 at 800 million board feet--about 95 percent of the allowable harvest (fig. 20). Since that time actual harvest has declined, because of changes in the classification of forest land and because manpower and budgets have not been adequate to cover the special planning, sales administration, and control required. Also, logging contractors have been reluctant to invest in expensive, advanced equipment to harvest lower value timber, particularly because few such systems have been thoroughly tested in Montana.

Montana's sawtimber resource tends toward small-diameter stems--one-third of the sawtimber volume is under 13 inches diameter breast high (d.b.h.). Diameters are smaller than in West Coast States, but larger than in the central and southern Rocky Mountains.

The timber resource is generally found on steep ground, and much of it is overmature with large amounts of cull and dead material. These factors have been a handicap in utilizing the timber resource. However, the capability for logging steep slopes has been improving, and in some localities markets for dead material are rapidly developing. Recent wood shortages and environmental concerns have stimulated research and management activities aimed at using more material formerly wasted.

Increasing the harvest of nonsawlog material will depend on the availability of markets and costs of transportation. Posts, poles, and similar products have historically used only a small portion of the available timber. Even though small stems and defective or dead trees are now being utilized for sawlogs, the amount of material now left behind as nonmerchantable far exceeds immediate demand. If harvest of sawlogs should increase, the availability of residues at mills and in the woods will also increase.

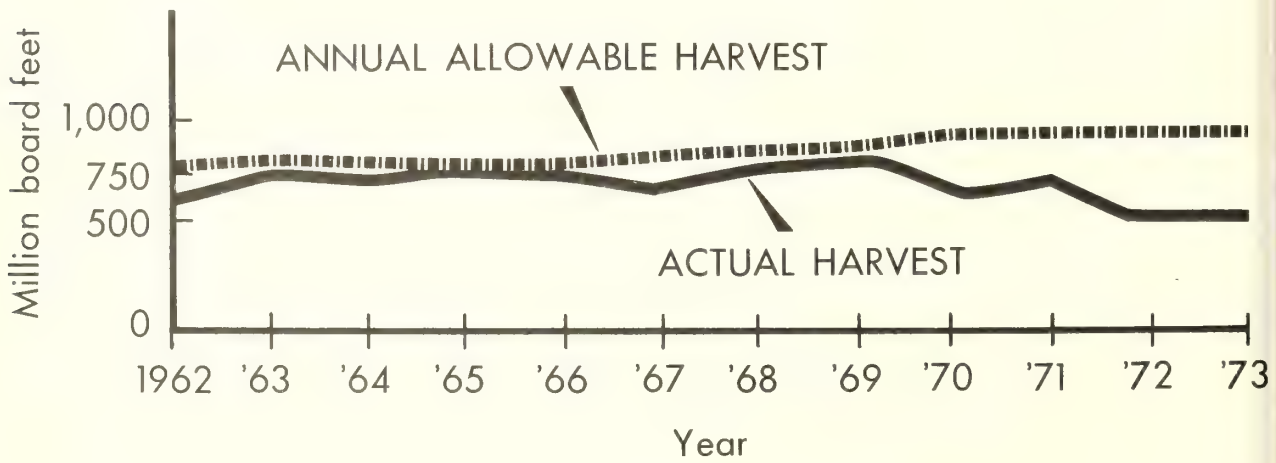

Figure 20.--Actual and allowable harvests of National Forests in Montana.

Future Timber Production

Every projection made to date has suggested that national markets for lumber and other major wood products will increase for at least the next several decades. But the ability of the forests of Montana to share in meeting this increase--or in continuing at present levels of production--hinges on as yet unresolved questions concerning the extent of the land base that will be devoted to timber production and the quantities of products that can be harvested from a given base.

Possible Changes in the Timberland Base

Increases in the National Wilderness Preservation System pose the most dramatic possible reduction in the timberland base. By 1974 the Forest Service had identified more than 1,600,000 acres in Montana as having all the qualifications required of Wildernesses. These acres, designated New Study Areas (USDA Forest Service 1973b), are shown on figure 8. New Study Areas resulted from a lengthy analysis that included extensive public participation. Each area was assigned a Quality Index based on scenic quality and the opportunities for users to achieve both solitude and a variety of experiences. In figure 21

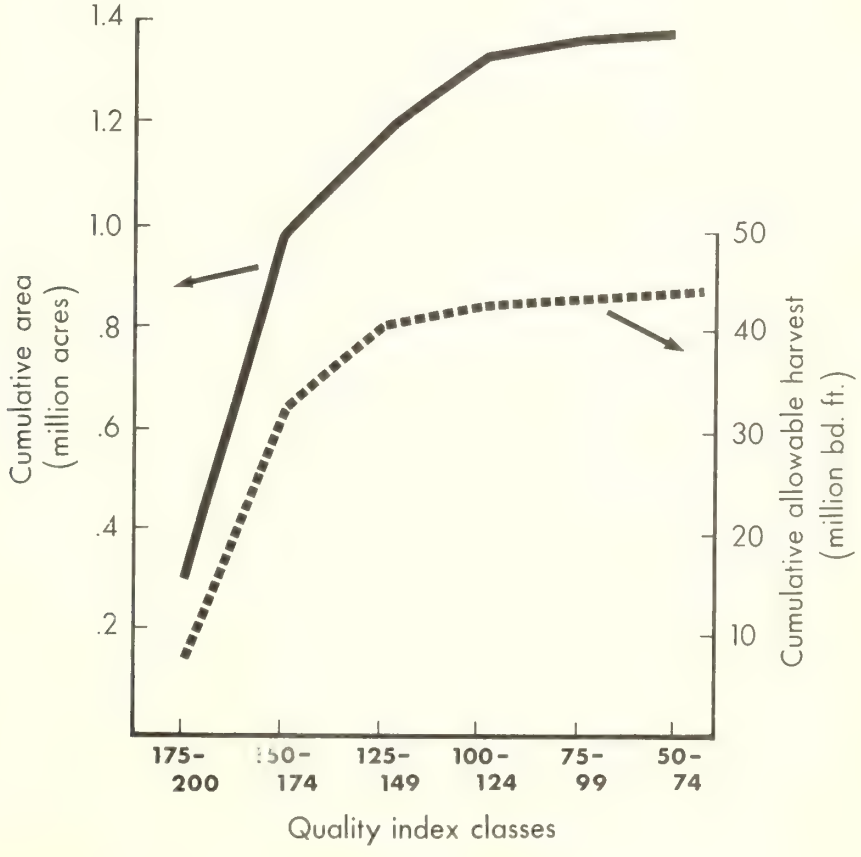

Figure 21.--Cumulative acreages and allowable harvests of New Study Areas by Quality Index classes, Montana.

we have ranked the New Study Areas in Montana by Quality Index (200 = highest possible Quality Index) and plotted the acres and allowable timber harvests involved[3].

Final disposition of the New Study Areas depends upon the completion of detailed management planning. If the top half of the Quality Index-ranked areas were permanently withdrawn from timber production, about 35 million board feet of timber would be lost annually; withdrawing all of these lands would imply giving up the potential harvest of about 45 million board feet annually.

These estimates are only preliminary and will no doubt be adjusted, perhaps substantially, as a result of detailed study. Because productivity of these areas averages only about 31 board feet per acre per year, with a range from 15 to 62 board feet, some of the least productive areas will likely be declared uneconomic to harvest at all.

Because New Study Areas have already been withdrawn from allowable-cut planning they threaten no reduction in current harvesting levels. Instead, the allowable harvests of areas returned to the timber base will be net additions to then-existing harvesting levels.

In contrast to the New Study Areas, removing the remaining roadless areas from the commercial forest land base would reduce the presently calculated allowable harvest levels. Preliminary estimates suggest the direct impacts of such removals would be on the order of hundreds of millions of board feet, a substantial portion of the present allowable harvest.

There would be an additional indirect effect of any massive land withdrawals. Historically, timber harvesting was concentrated where adequate access roads existed. Harvesting was carried out with the expectation that those areas would not again be disturbed for several decades so that wildlife populations and watershed values would not be unduly affected. A nondeclining flow of timber was to be achieved by entering other lands, including those then-unroaded areas that have recently become candidates for permanent withdrawal from timber harvesting. An earlier-than-planned reentering of already harvested lands in some instances has the potential for unacceptable ecological damage.

About a quarter of the allowable harvest is planned for "marginal" and "special" categories of the commercial forest land base. These areas have been identified as needing special consideration for timber harvesting, for economic, esthetic, or ecological reasons. To the extent that satisfactory harvesting techniques can be developed and applied, these lands can supply a larger-than-planned volume of timber.

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[3]The five largest New Study Areas received the highest Quality Index ratings. For a critique of the rating procedures, see Milton (1973). Some Areas on the Gallatin and all Areas on the Custer National Forest were excluded from figure 21 because Quality Indexes had not been developed (all excluded areas are small).

Possible Changes in Timber Management

For the most part, the Forest Service is still managing an old-growth resource in Montana. But in areas where timber has been or will be harvested, the production of wood products can be increased through intensive management.

In general, wood production can be increased by speeding up regeneration, by minimizing the time between regeneration and harvesting, by reducing losses of growing stock to natural mortality, insects, diseases, and fire, and by improving the utilization of the timber that is harvested. A necessary precondition to these opportunities is the development of an adequate road system.

In 1972, about 3.25 million acres of National Forest lands needed either regeneration or stocking control in the Northern Region, which includes northern Idaho (fig. 22). The most pressing need was stocking control in stands that had not previously been harvested. This included about 300,000 acres in Montana where 1,000 to 3,000 board feet per acre could be thinned; some of the thinnings would likely be marketable. About 60,000 acres of National Forest lands in the State, excluding high elevation zones, were nonstocked.

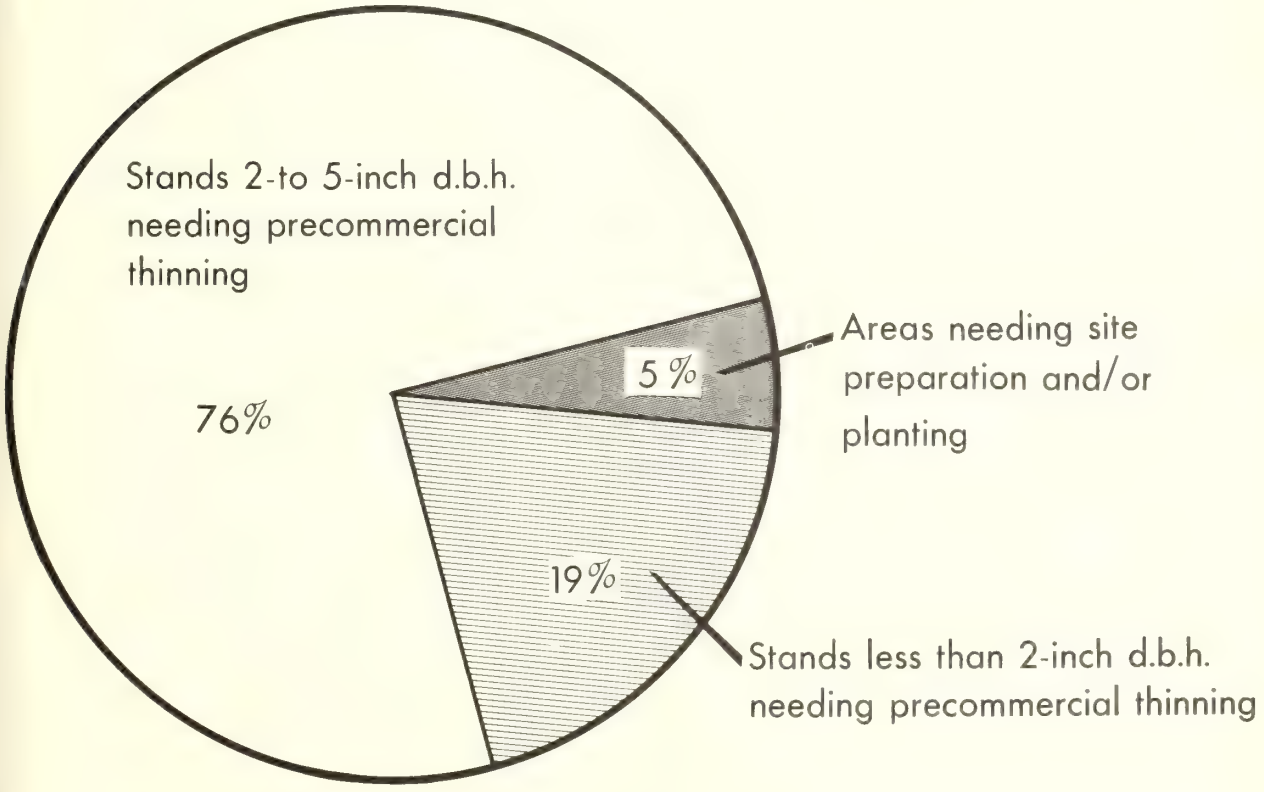
Stands 2-to 5-inch d.b.h. needing precommercial thinning
76%
5%
Areas needing site preparation and/or planting
19%
Stands less than 2-inch d.b.h. needing precommercial thinning

Figure 22.--Areas needing regeneration and precommercial thinning in the Northern Region, 1972.

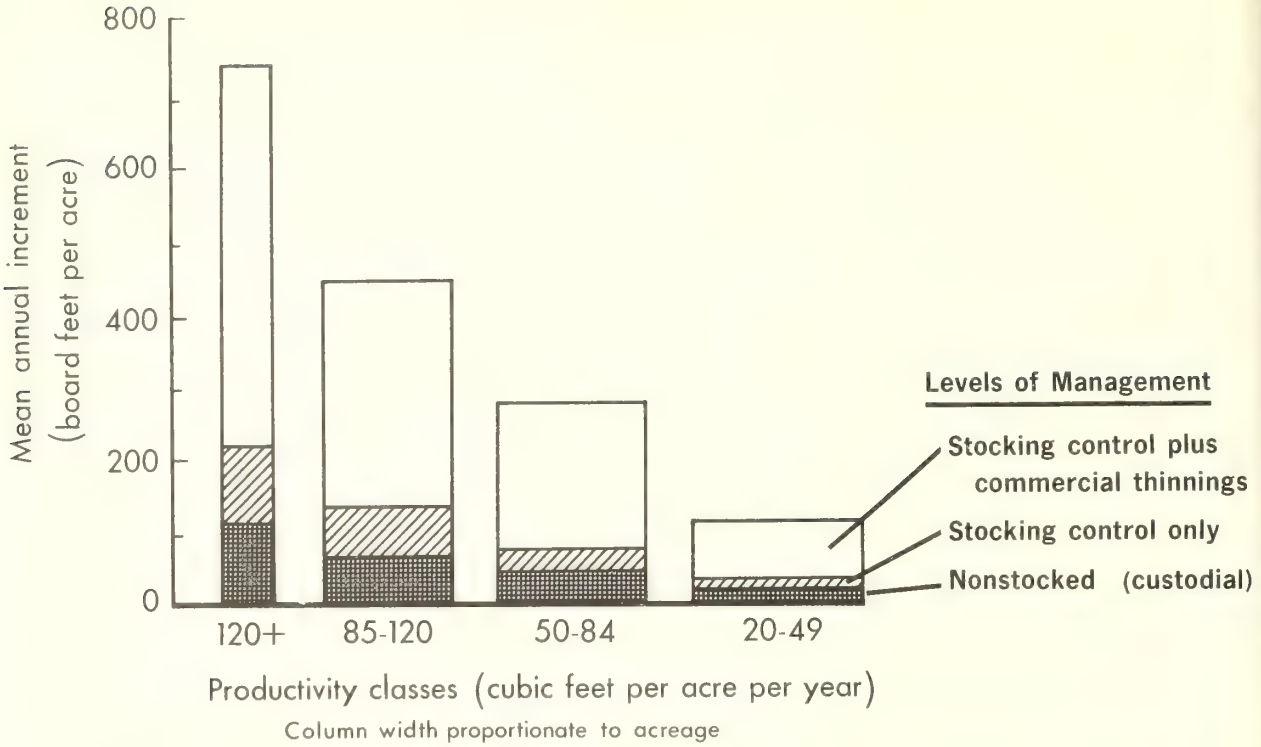

Figure 23.--Achievable mean annual increments under alternative management regimes by productivity classes (Northern Region Office data, 1972).

The potential gains in growth from regeneration and thinning are shown in figure 23. Adequate stocking controls alone would, on the average, double growth over that in wild stands. If, in addition, three commercial thinnings were carried out on the best sites, merchantable wood production could be tripled. Two commercial thinnings on the medium sites and one thinning on the poorest sites also promise substantial increases.

Tree improvement through the planting of genetically superior stock also will lead to increased growth rates and the production of a superior product. Trees being planted now are expected to increase timber yields by about 15 percent in 30 or 40 years (Howe 1973).

Net growth in Montana's old-growth timber varies from 60 to about 150 board feet per acre per year. Forestwide, annual yields under intensive management are expected to exceed 400 board feet per acre on the Flathead, Kootenai, and Lolo National Forests and to exceed 200 board feet on other Forests. The ability to replace the old growth with second-growth forests, and to achieve the higher growth rates, is dependent upon rates of road development and operating budget levels.

These items are also critical when we consider the assumptions basic to allowable harvest calculations. For the National Forests in Montana, present planning assumes that all stands undergoing regeneration harvests will then have stocking control and commercial thinning (fig. 23). As a result, the

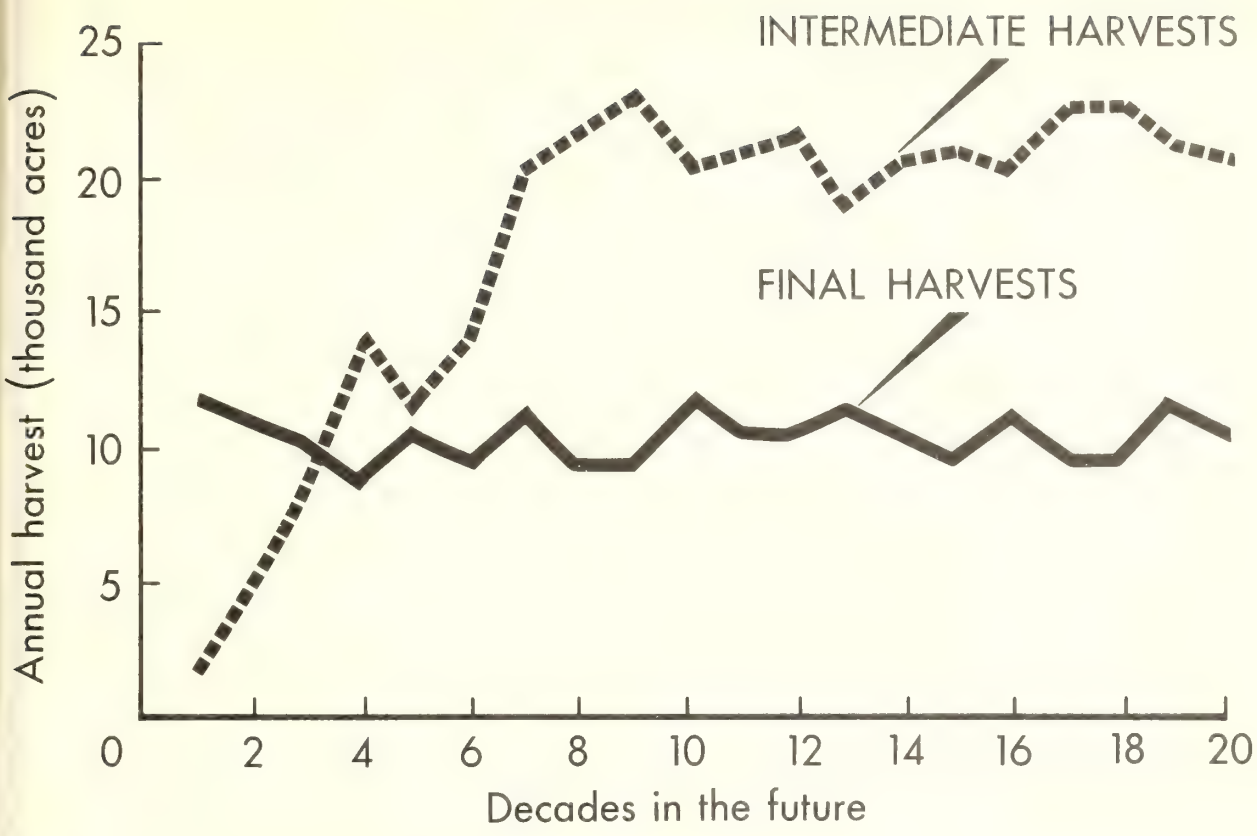

Figure 24.--Preliminary estimate of harvesting program for the Flathead National Forest (excluding overstory removals).

allowable harvest will steadily increase for 60 to 80 years and then stabilize. This is illustrated for the Flathead National Forest in figure 24. Acreages were generated by the Forest Service's computerized Resource Allocation Model (RAM), which most National Forests in Montana are now using in long-range planning. Within 70 years, it is expected that twice as many acres will be commercially thinned as will be undergoing final harvests. Although much higher total yields are likely, such a program will also be more expensive to administer. On the average, thinning will produce between one-third and one-half as much wood per acre as final harvests; the sale preparation and administration costs per unit volume will be substantially higher.

The historical trend has been toward utilizing more and more of the available wood. Diameter limits for harvest have gone from 13 inches d.b.h. or more, to currently 8 inches or even 7 inches. Top-diameter limits have gone from 8 inches or more to 2-1/2 inches in some species. In the early days, trees were often cut selectively. This took only a few of the choicest trees and left everything else growing, so direct "loss" cannot be estimated with confidence. When clearcutting became widespread practice, often 50 percent or more of the original fiber volume was left on the ground. Several recent studies indicate that virtually all (97 percent) of the available wood, live or dead, could be recovered for fiber use (Gardner and Hann 1972). Soon, up to 25 percent more wood might be recovered for sawlog or other solid wood use

under utilization standards now being developed. This, of course, is highly variable, depending on species and proportions of dead, rotten, or other cull trees.

These are not all the changes that could affect allowable harvest levels, but they are the ones most likely to occur in the near future. Rough estimates of the maximum impacts on harvest levels for each of these changes are summarized below; note that these impacts are not additive:

	Change in annual allowable harvest (Percent)
All roadless areas removed from commercial forest land base	-35
Marginal areas do not become available for harvest	-15
More time required to replace old growth with second-growth stands	-15
Less time required to replace old growth with second-growth stands	20
Intensive management (reforestation and thinning)	20 to 30
Tree improvement (harvest increase in 30 to 40 years)	15
Utilization improvement	25

CHAPTER III

PRODUCTION OF WOOD PRODUCTS

During the past decade, Montana has provided between 3-1/2 and 4 percent of the total softwood lumber consumed in the United States. The bulk of the 246 million cubic feet of wood harvested in Montana in 1969 was in the form of sawlogs and veneer logs. Total harvests were about the same as 5 years earlier, but nearly double those of the late 1950's. Harvested wood was in the forms listed below (Setzer 1971):

Timberland products (1969)	*Share of output (Percent)*
Sawlogs	85.9
Veneer logs	11.6
Pulpwood	.7
Mine timbers	.6
Poles	.3
Other	.9
	100.0

About one-fourth of the veneer and sawlogs used in Montana were Douglas-fir (fig. 25); ponderosa pine and western larch were other principal species. Mine

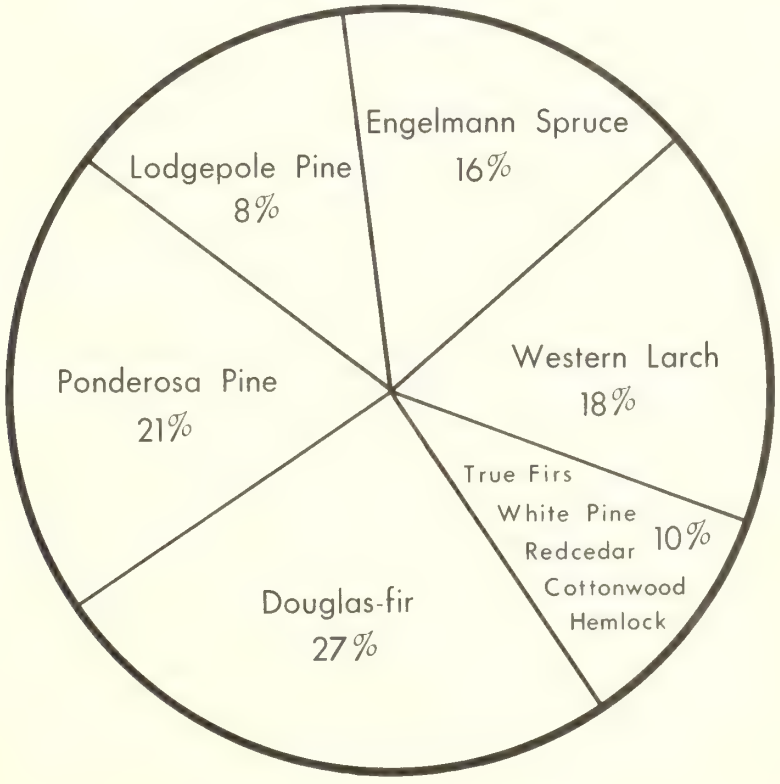

Figure 25.--Proportions of log volumes received by Montana mills by species, 1969.

timbers were manufactured primarily from Douglas-fir and western larch. Lodgepole pine was used in most of the other minor forest products.

Logs came principally from six counties (Setzer 1971):

County	*Share of logs (Percent)*	*Principal species by volume*
Lincoln	39	Western larch, Douglas-fir, ponderosa pine
Flathead	17	Engelmann spruce, Douglas-fir
Missoula	9	Ponderosa pine, Douglas-fir
Lake	6	Western larch, Douglas-fir
Ravalli	6	Douglas-fir, ponderosa pine
Sanders	5	Ponderosa pine, Douglas-fir
Others	18	Ponderosa pine, Douglas-fir
	100	

The important role of Douglas-fir in Montana is emphasized by its appearance as one of the two principal species for each of the leading log-producing counties. Only a small percentage of logs came from out of State.

Plywood mills in Montana--the first ones were built in the 1950's--currently supply about 3 percent of U.S. softwood plywood. Output of other products--poles, posts, etc.--is relatively minor in Montana and accounts for about 2 percent of the total U.S. consumption.

In the last few years, private timberlands have provided an increased share of Montana's log production:

Ownership	*Percent of total log production*						
	1965	*1966*	*1969*	*1970*	*1971*	*1972*	*1973*
National Forests	58	59	61	60	59	51	51
Other Public	6	9	11	9	8	11	11
Private	36	32	28	31	33	38	38

In fiscal year 1971, about 660.5 million board feet of logs were received at Montana mills from National Forests within the State. The origins and destinations of these logs are summarized in table 1 for the 12 forests involved. (Note that the county log receipts in the table do not include logs from privat lands or from public lands other than National Forest.) Perhaps an additional 40 million board feet were imported from the Clearwater and St. Joe National Forests in Idaho (primarily to Superior and Missoula), and about 20 million board feet were exported from the State.

Table 1.--*Flows of logs from Montana National Forests to Montana Counties, 1971*

Receiving county	National Forest of origin												
	Beaverhead	Bitterroot	Clearwater	Custer	Deerlodge	Flathead	Gallatin	Helena	Kaniksu	Kootenai	Lewis & Clark	Lolo	TOTAL
	Million board feet												
Beaverhead	2.1				0.1								2.2
Broadwater					1.1			2.8					3.9
Carbon				0.3									.3
Deerlodge					.5								.5
Fergus											0.1		.1
Flathead						132.2				26.3		9.3	167.8
Gallatin							16.4						16.4
Granite					10.6								10.6
Jefferson					.7								.7
Lake						13.7						9.8	23.5
Lewis & Clark								2.8					2.8
Lincoln						2.4			10.8	163.4			176.6
Madison					.2								.2
Meagher								1.2			14.7		15.9
Mineral			0.1									10.0	10.1
Missoula		6.0	8.0		9.7	.8		3.4				71.3	99.2
Musselshell											.5		.5
Park							6.8						6.8
Powell	4.8				13.2			1.4					19.4
Ravalli	9.1	40.1			.6								49.8
Rosebud				.1									.1
Sanders									25.9			24.3	50.2
Silver Bow					2.5								2.5
Sweet Grass							.4						.4
Subtotal Montana	16.0	46.1	8.1	.4	39.2	149.1	23.6	11.6	36.7	189.7	15.3	124.7	660.5
Outside Montana			116.1	.9					121.4	16.0		19.7	274.1
Total	16.0	46.1	124.2	1.3	39.2	149.1	23.6	11.6	158.1	205.7	15.3	144.4	934.6

Montana's Wood Products Industry

The wood processing plants in Montana, listed by products, are:

Product	*Number of processing plants*		*Total 1973 production*	*Comments*
	1966	*1973*		
Lumber	148	100-125 est.	1,350 MM bd. ft. est.	Average size increasing
Plywood and veneer	6	5	460 MM ft^2	The State's largest mill at Bonner was not yet in production. One mill operated just 3 months in 1973
Particleboard	0	1	100 MM ft^2	1 fiberboard/particleboard mill at Columbia Falls was under construction. Third mill proposed at Bonner to nearly double output.
Paper and pulp	1	1	1,150 tons/day	65% increase in output proposed.
Posts, poles, piling, houselogs	30 est.	30 est.	Unknown	Now four pressur treating facilities in Stat
Christmas trees	Unknown	Unknown	2 MM trees est.	Declined since late 1950's.

Lumber Production

As in most of the United States, there has been a long-term reduction in the number of small sawmills in Montana. Between 1956 and 1966, the number of mills producing less than 10 million board feet per year had declined from 307 to 111. At the same time, the number of mills producing more than 10 million board feet increased from 26 to 37, and their average annual production went up from 25 to 35 million board feet. By 1966, lumber production was split among mills as follows (Setzer and Wilson 1970):

	Total	Annual mill production (1966)		
		More than 10 MM bd.ft.	1-10 MM bd.ft.	Less than 1 MM bd.ft.
umber	148	37	25	86
roduction (MM bd.ft.)	1,375	1,238	80	57
hare of total production (Percent)	100	90	6	4

Although there has been no recent survey, we estimate that the number of maller mills declined substantially. This judgment is supported by the changes n numbers of sawmills and planing mills illustrated in figure 26 (developed rom annual reports of the Census of Manufacturers). While the total number of ills has been declining at an average rate of six or seven per year for 15 ears, the number of larger mills has remained nearly constant. For 1973 we dentified 22 individual mills that each produced between 10 and 50 million oard feet annually and another seven mills that each produced more than 50 illion board feet.

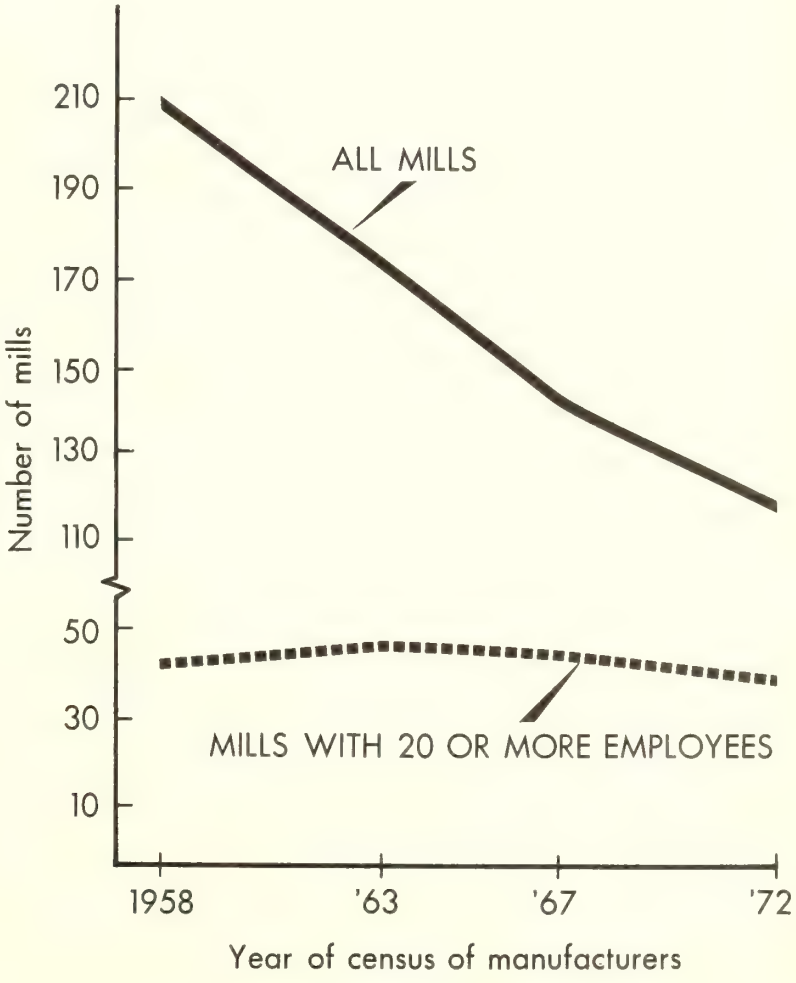

Figure 26.--Numbers of sawmills and planing mills in Montana, 1958-1972 (SIC 242).

Perhaps the most striking characteristic of the sawmill industry is its pattern of ownership. Nearly all of the mills producing more than 10 million board feet annually are owned by multi-State corporations headquartered outsid of Montana. In figure 27, the shares of Montana's 1973 lumber output are identified for all corporations owning mills that in the aggregate produced mo than 50 million board feet within the State (Forest Industries 1974b). Those corporations alone produce more than three-fourths of the State's total lumber

Major lumber producers are important nationally as well as within Montana Louisiana-Pacific, currently the nation's leading lumber producer, in 1973 acquired several wood products firms in Montana. In the aggregate, Montana lands contribute about one-fourth of the total United States production of the corporate giants (table 2).

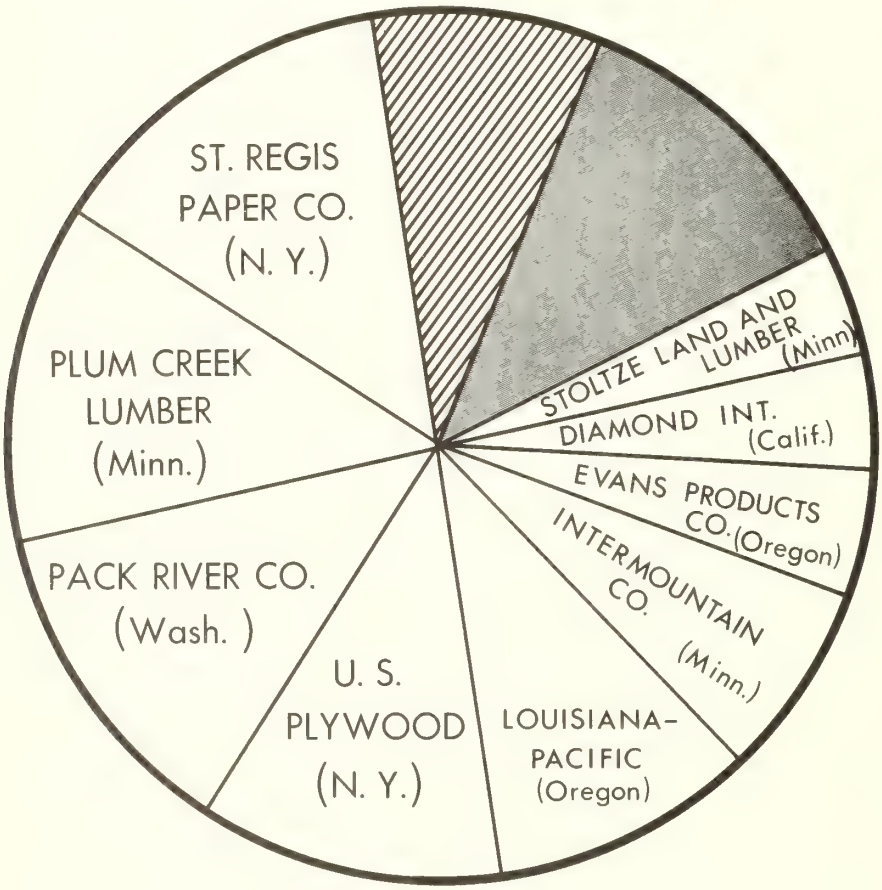
ST. REGIS PAPER CO. (N. Y.)
PLUM CREEK LUMBER (Minn.)
PACK RIVER CO. (Wash.)
U. S. PLYWOOD (N. Y.)
LOUISIANA-PACIFIC (Oregon)
INTERMOUNTAIN CO. (Minn.)
EVANS PRODUCTS CO. (Oregon)
DIAMOND INT. (Calif.)
STOLTZE LAND AND LUMBER (Minn.)
Annual production of firm:
Less than 10 million bd. ft.
10-50 million bd. ft.
Over 50 million bd. ft.

Figure 27.--Montana 1973 lumber production by major firms and locations of corporate headquarters.

Table 2.--*Selected characteristics of firms producing more than 50 million board feet of lumber in Montana in 1973*

Firm (and corporate owner, if different)	Montana lumber production	No. Montana mills	Montana production as percent of firm's total U.S. lumber production	Production ranking among U.S. lumber firms
	MM bd.ft.		*Percent*	
E. Regis Paper Co.	196	2	52	11
Plum Creek Lumber (Burlington Northern)	195	4	100	24
Rock River Co.	174	4	29	6
U.S. Plywood (Champion International)	171	3	26	5
Louisiana-Pacific Corp.	135	4	6	2
Intermountain Co. (Hoerner Waldorf)	112	2	84	32
Evans Products Co.	63	2	100	79
Diamond Int'l.	61	1	17	14
Koltze Land & Lumber	53	2	100	95
	1,160	24	25	

The sawmills are not scattered throughout Montana, but are concentrated mostly on the timber-rich lands west of the Continental Divide. In 1973, four communities produced more than 100 million board feet, five exceeded 50 million board feet, and 19 produced between 10 and 50 million board feet (fig. 28).

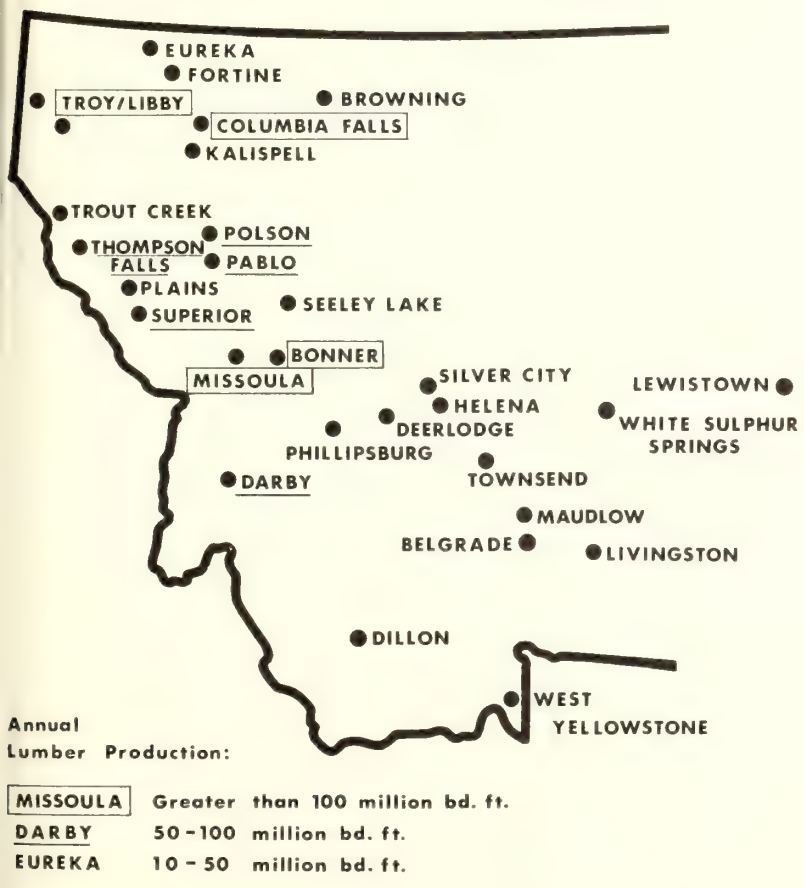

Figure 28.--Principal lumber production centers in Montana, 1973.

U.S. Plywood has just completed enlarging its mill at Bonner, making that community a major production center. Other mills currently being enlarged or under construction are located at White Sulphur Springs and Roundup.

Increased production has led to more mill residues. Tough new standards limiting air pollution have exerted pressures on industry to use, not burn, these materials. A strong demand for wood chips in Missoula and outside the State has provided markets. Concentrating production in larger mills has permitted the economies of large-scale operations necessary to economically proces and transport wood chips. Mill residues consist of slabs and edgings, which are generally converted to chips; of planer shavings and sawdust, used for fuel and particleboard; and of bark, which can be used for fuel. On balance, smalle volumes of these residues are wasted now than a few years ago (Setzer 1971):

Year	*Residues*	*MM Ft^3*		*Used Percent*	
1969	Coarse	61	118	87	74
	Fine	57		60	
	Bark		38		28
1966	Coarse Fine		73		66

Plywood and Veneer Production

Four mills presently produce softwood plywood and veneer in Montana (Fig. 29); the mill at Polson closed early in 1973 and a small plywood plant at Whitefish burned down in 1970. The plants are all located in western Montana from Kalispell south to Missoula. As in the case of lumber production, the bulk of plywood production is controlled by firms with interests outside Montana (Forest Industries 1974a).

The locations of plywood production and other nonlumber wood products plants are shown in figure 30.

U.S. Plywood's mill, reported to be the world's largest plywood mill under a single roof, has begun production at Bonner. This new mill is expected to increase statewide plywood output by two-thirds, to 750 million square feet annually, and will supply about a quarter of that firm's national plywood production.

Particleboard Production

In 1973, Evans Products of Missoula was the only particleboard plant in Montana. It produced about 100 million square feet (on a 3/4-inch basis).

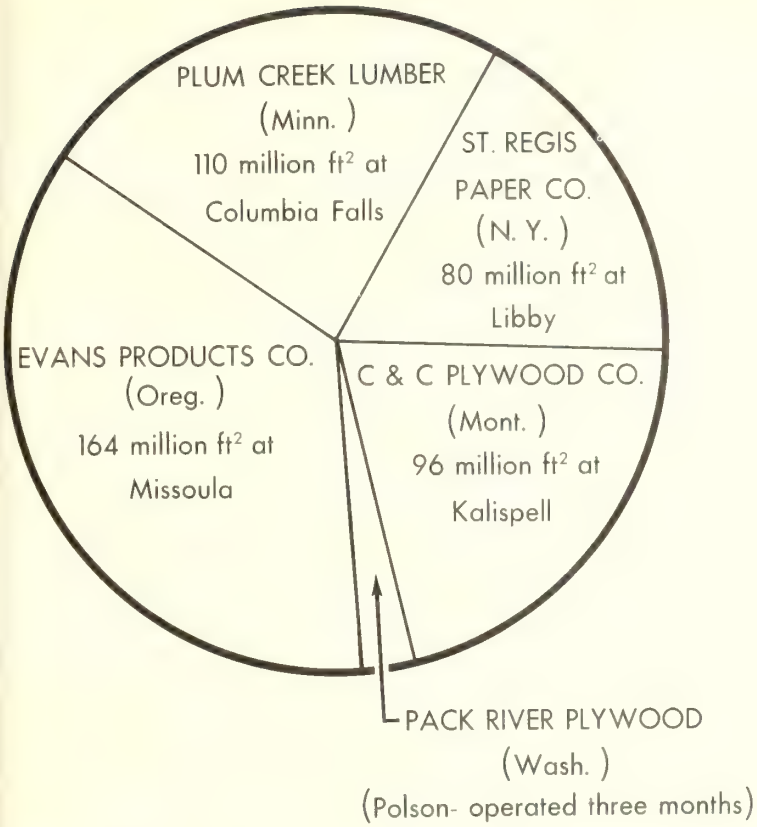

Figure 29.--Montana 1973 plywood production (square feet, 3/8-inch basis) by firms and locations of corporate headquarters.

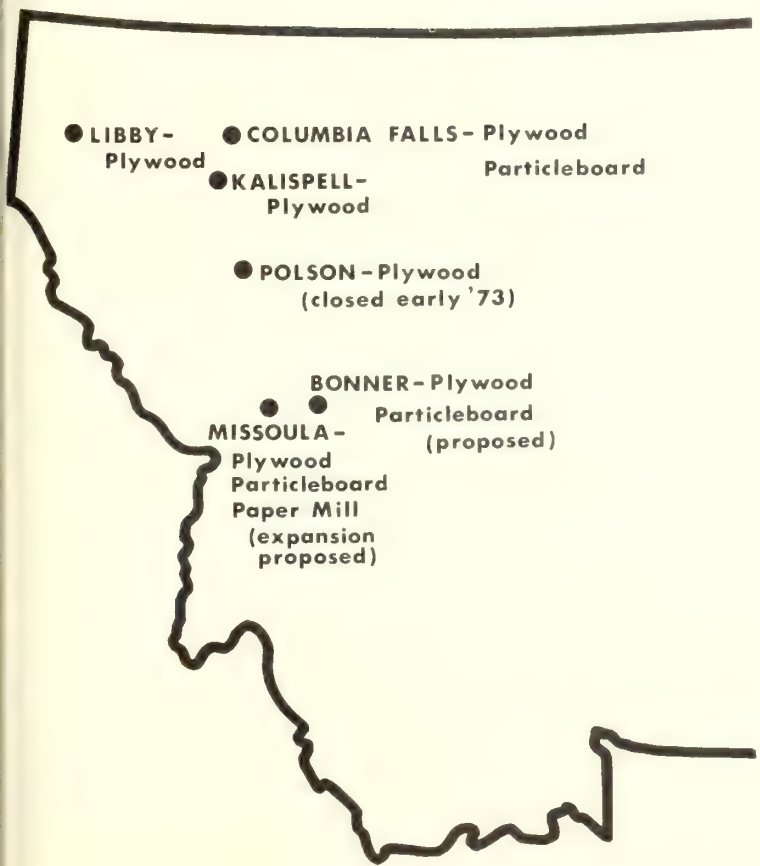

Figure 30.--Production centers for plywood, particleboard, and paper in Montana, 1974, and prospective additions.

A Plum Creek Lumber Co. plant now in production at Columbia Falls will concentrate on fiberboard, but it will also be able to produce particleboard. Its annual production is expected to be about 70 million square feet. A major additional particleboard plant, that might double the State's total current production, has been reported to be under consideration by U.S. Plywood at Bonner.

Paper Production

Hoerner Waldorf's mill in Missoula is the only papermill in the State. Current daily production is about 1,000 tons of linerboard and 150 tons of bleached pulp. Recently announced expansion plans would increase output to a combined total of 1,850 tons per day of kraft pulp, paper, and linerboard. It has been announced that the total annual wood use for the expanded plant would be about 3 million cubic feet of roundwood and 121 million cubic feet of mill residues.

During periods when sawmill production has been restricted, as in 1969 and 1974, Hoerner Waldorf has relied more heavily on roundwood--dead material that has not been part of the growing stock of the forest. Recently, competition for chips (and even for dead roundwood) from west coast mills has increased the firm's reliance on roundwood.

To convert roundwood to chips, by the end of 1974 Hoerner Waldorf had established permanent chipping installations at Missoula, Columbia falls, and Dillon. In addition, three portable chippers were being moved between wood concentration points near Darby, White Sulphur Springs, Belgrade, Livingston, and other lumber production centers.

Future Increases in Mill Capacity

In spite of the 1974 slump in lumber production, wood products manufacturers are generally bullish on Montana. Announced plans for the expansion of production for all the major wood products are:

Product	*Additional capacity*
Lumber	100 million board feet annually
Plywood and veneer	300 million square feet annually
Particleboard	100 million square feet annually
Paper and pulp	700-750 tons per day

If these plans are realized, some increases may simply offset losses of mills leaving the market. The trend toward multi-State corporate ownership and the high capital investments made in recent years suggest that only the least productive mills will be lost.

Other Products

Only limited data are available on miscellaneous roundwood products and Christmas trees. Total volume of wood used and total employment are a small

part of State totals, but can be important locally. Output of transmission poles has declined in the past two decades due to market conditions and to the economies of production. However, posts, corral poles, house logs, and similar items have developed strong markets in interstate highway fencing, ranchette development, and rustic decorations. Volume of these products is approximately:

	Million cubic feet
Pulpwood (round)	1.6
Transmission poles	.8
Mine timbers	1.8
Posts, corral poles, etc.	1.3
Miscellaneous	.6

Christmas tree shipments declined from a peak of 4 million in 1956 to about 2 million in 1964. Current output is estimated at about 2 million trees per year. This long-term decline has been caused by a growing market preference for plantation-grown trees and artificial trees and partly by insect damage to wild trees.

Marketing of Wood Products

Species and Sizes

Although Montana makes an important contribution to the national supply of forest products, it does not claim any unique products or tree species. Its contribution is mainly commodity wood products. One species, western larch, is primarily found in western Montana and north Idaho. In a few instances larch lumber, sold as "Montana cypress," brings a premium price in select grades. However, this use is of relatively minor importance, and for the most part Douglas-fir and western larch are sold as "fir-larch" lumber. Prices for this mix are generally slightly lower than the price of west coast Douglas-fir lumber.

The only other species that might be considered unique is lodgepole pine--because it comprises such a large portion of the total timber inventory. Lodgepole is generally of small diameter and, because of processing costs and early resistance in the market, has only recently established itself as a major lumber species. Today, the market neither discriminates against nor favors lodgepole lumber.

Lodgepole is well suited for pulpwood and small roundwood products such as posts, poles, and house logs. However, the markets for these are so weak that lodgepole is not being fully utilized presently (Benson 1973).

In general, Montana's forests offer mixed species such as Douglas-fir/larch, Douglas-fir/ponderosa pine, and spruce/true firs. Mixed species are considered to be more resistant to some insect and disease pests than pure stands. Lodgepole pine is an exception because it usually grows in relatively pure and even-aged stands. Overmature stands are subject to insect and disease attacks that result in large-scale mortality.

Potential for Utilizing More of the Wood Resource

Early timber harvests in Montana took only the largest, best quality, and most accessible trees. Harvesting practices and utilization standards gradually changed. Sizes and species are now being utilized that 10 years ago or less would have been left in the woods. For example, National Forest timber sales consider trees of 7-inch d.b.h. sawtimber. Any piece that could yield 10 board feet must be removed from the sale area. Some manufacturers with specialized equipment are taking logs as small as 3-inch and 4-inch top diameter to be sawed into lumber. Despite improvements in utilization, a considerable amount of additional wood could be utilized. Logging slash--tops, small trees, defective trees, broken chunks, etc.--can range from less than 50 to more than 100 tons per acre.

One of the principal obstacles to greater utilization of wastes is the lack of local markets for wood fiber. The papermill and particleboard plants operate primarily on residues generated at lumber and plywood plants, material that "rode free" on sawlogs from the woods. Hauling roundwood from the woods specifically for these products would be comparatively expensive. It has been estimated that two additional particleboard plants could operate on the available fine residues (Withycombe, in press). The pulpmill, however, has occasionally used round pulpwood to supplement mill residues and most of the proposed expansion would be based on roundwood.

In the Bitterroot Valley, a local Resource Conservation and Development group is currently exploring the feasibility of harvesting timber using a low investment operation such as horse logging or small tractors. The objective is twofold: to supplement income of local residents who might devote several weeks or months per year to logging with equipment they have on hand; and to utilize a resource such as small size, low-volume lodgepole stands that wouldn't justify full-scale logging (Bjergo 1972).

Geographic Location

For years the harvest of timber in Montana was only a fraction of its potential, mainly because of the State's isolation--Montana is a long way from the principal wood products markets--and because forest access roads were lacking.

As market demands increased, particularly in the last two decades, prices for wood products rose. As access roads were developed, the timber harvest approached the allowable harvest established for sawlogs. Even though the distance to eastern markets hasn't changed, the development of a strong industry, establishment of competitive freight rates, and viable marketing practices have largely diminished any locational disadvantages. Nowadays most Montana producers participate in national markets, either through their internal nationally-oriented marketing organizations or through wholesalers (Adair 1966).

Strong demand for pulpwood has improved the outlook for marketing material not suitable for sawlogs. Some roundwood pulpwood is now being shipped from eastern and central Montana to Lake States papermills. Also, some pulp chips are now shipped to west coast mills, and there are strong indications that this market will grow.

Nevertheless, local increases in particleboard production and similar fiber products will largely depend on available mill residues rather than large-scale use of logging residues or roundwood. Several areas in the Northern Rocky Mountains have concentrations of unused mill wastes, including the Kootenai Valley around Libby. The Flathead area and lower Clark Fork also have substantial quantities of unused residues at scattered mills, but long hauls to a central plant would be required to utilize them (Withycombe, in press).

Industry Investments and Productivity

Expenditures to replace or expand existing capital assets have been increasing statewide for at least a decade, growing from $39 million in 1963 to $75 million in 1972. For much of that time, the lumber and wood products firms have been leading the way as suggested in the following tabulation:

	New capital expenditures		
	1963	*1967*	*1972*
	(Millions of dollars)		
Logging	3.0	0.0	2.2
Sawmills, planing mills	6.0	3.2	6.0
Veneer, plywood, and particleboard	.7	1.4	5.3
All lumber and wood products	9.8	6.2	15.9
	(Percent)		
All lumber and wood products as a proportion of all industries	25	9	21

Because the wood products industries are labor intensive, the most widely used index of industrial productivity, value-added-per-employee, is low relative to other manufacturing industries in Montana. Considering heavy capital investments recently made in wood products, value added would be expected to increase. In comparison with value-added-per-employee achieved by similar industry in the Rocky Mountain region and in the United States as a whole, however, Montana's wood products industry dropped from first to last place between 1956 and 1971 (fig. 31). Until 1971, at least, Montana's industry had not kept pace in spite of substantial capital investments. We suspect that in the late 1950's--the onset of declining productivity--that harvesting had exhausted much of the prime, lowland timber and began to move into less profitable stands at higher elevations.

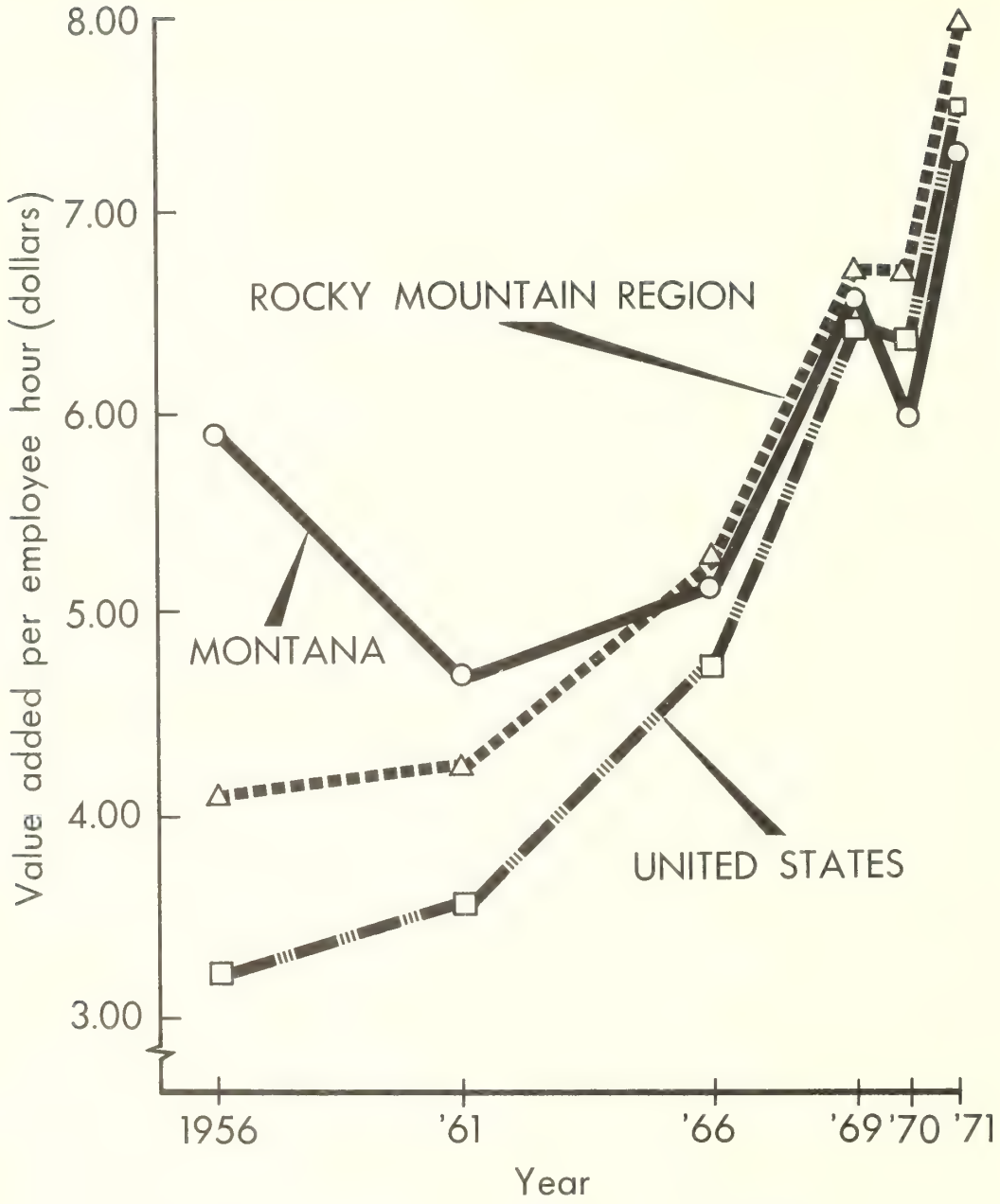

Figure 31.--Value added per production employee hour for the lumber and wood products industry.

CHAPTER IV
PRINCIPAL NONTIMBER USES OF THE FOREST

The preceding section on the timber-based industries has been developed in detail because of their economic importance and because data are available. However measured, much less is known about the other forest resources and their importance. This chapter describes the more important aspects of recreational use of forested lands, and then briefly discusses grazing and mining.

Recreational Use

In 1969, out-of-State tourists in Montana, excluding transportation, were estimated to support a $145.5 million industry (Mussehl and Howell 1971). A substantial share of these dollars were, no doubt, spent by visitors traveling to forested parts of the State. Other dollars were spent for second homes, recreation sites, and activities that depend upon nearby forests to provide desirable settings.

Twelve Montana counties increased in population by more than 10 percent between 1960 and 1970 (fig. 32). Most of these counties lie in forested western

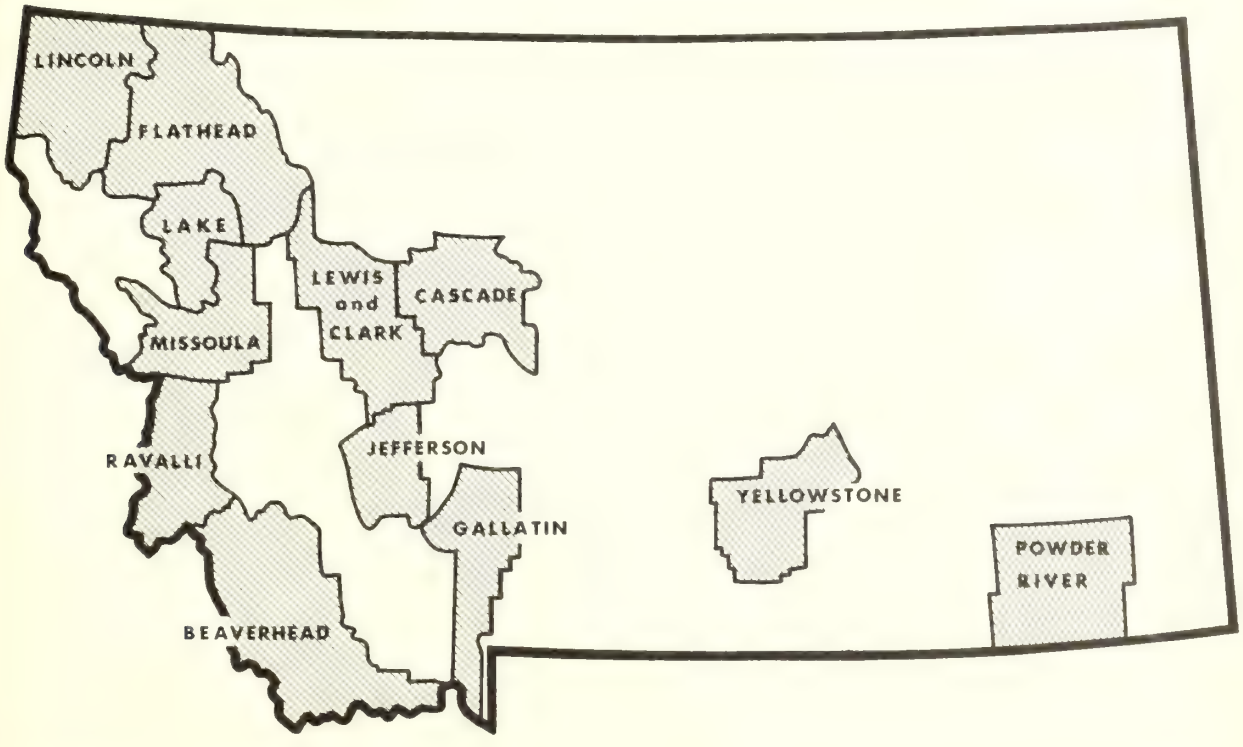

Figure 32.--Counties increasing in population by more than 10 percent, 1960-1970.

Table 3.--*Characteristics of counties with population growth of more than 10 percent, 1960-1970 (Gustafson 1973)*

County	Major public expenditures	Indian Reservation population growth	High amenity values	Other factors
Beaverhead	Education		X	
Cascade	Military			Trade center
Flathead		X	X	Wood products industry
Gallatin	Education		X	
Jefferson			X	
Lake		X	X	
Lewis & Clark	State government			
Lincoln			X	Dam, railroad construction
Missoula	Education	X	X	Wood products industry
Powder River				Oil development
Ravalli			X	Residential development
Yellowstone	Education	X		Trade center

Montana. Two-thirds of these counties have been rated as high in amenity values (Gustafson 1973) in terms of forest, waters, and topography (table 3). Although population growth reflects employment opportunities in these areas, there is little doubt that this growth will put added pressures on the forest recreation resource. Growth has been most noticeable between Kalispell and Hamilton, including the Flathead Valley, the Missoula area, and the Bitterroot Valley. The Gallatin Valley south of Bozeman has recently experienced a similar accelerating growth.

Visits are not recorded for much of the forest land, but on just three principal forest land ownerships nearly 9 million visitor-days (1 visitor day = 12 hours of use) were counted in 1971:

	Visitor-days
National Forests	6,863,000
Bureau of Land Management	474,000
Glacier National Park	1,339,000
Yellowstone National Park (2,252,000 total estimated, 10 % for Montana)	225,000
	8,901,000

National Forests received a large portion of recreation visits, which have een recorded for many years. Based on these records, Montana National Forests ave received a sizable share of all recreation visits to National Forest lands:

	All National Forests (Visitor-days)	*Montana National Forests* (Visitor-days)	*Montana percentage of total* (Percent)
1967	149,647,000	5,565,000	3.7
1968	156,655,000	5,471,000	3.5
1969	162,838,000	6,037,000	3.7
1970	172,554,000	6,248,000	3.6
1971	150,562,000	6,863,000	4.5
1972	183,958,300	6,857,900	3.7
1973	188,174,600	6,980,700	3.7

The State has 13 percent of the Nation's acreage in Wildernesses and rimitive Areas, lands where development for any purpose (except trails and ccasional primitive visitor facilities) has been explicitly excluded. The xtent of recreation usage of the individual areas is shown in table 4 (USDA orest Service 1972). These areas make up between 11 and 12 percent of all ational Forest lands in Montana and receive about 5 percent of the recreation se. Of the State's total forested area of 22.8 million acres, 8 percent is

Table 4.--*Extent and use of Montana Wildernesses and Primitive Areas*

Name	Acreage	Visitor-days 1970	Visitor-days 1973[1]
WILDERNESSES			
Anaconda-Pintlar	158,000	19,000	26,300
Bob Marshall	950,000	115,000	106,600
Cabinet Mountains	94,000	9,000	14,000
Gates of the Mountains	29,000	2,000	1,300
Scapegoat	240,000	[2]	16,400
Selway-Bitterroot	252,000[3]	56,000	63,700
PRIMITIVE AREAS			
Absaroka	64,000	15,000	15,700
Beartooth	230,000	45,000	68,400
Mission Mountains	73,000	5,000	18,900
Spanish Peaks[4]	50,000	17,000	15,800

[1]Montana National Forests closed in August due to high fire danger.
[2]Created in 1972.
[3]Montana only; also about 1 million acres in Idaho.
[4]Proposed for expansion to 63,000 acres if classified as Wilderness.

currently in Wildernesses or Primitive Areas, 7 percent is currently under stu to determine suitability for addition to the Wilderness System, and about 4 percent is currently included in the Yellowstone and Glacier National Parks (m at back of book).

Overall use figures show that on National Forest lands within Montana mor time is spent traveling, either for its own sake or incidental to some other activity, than in any other recreation-oriented pursuit:

Activities, 1973, Montana National Forests	*Percent of total time spent in recreation*
Mechanized travel	26
Camping	20
Hunting and fishing	20
Winter sports	5
Recreation residences	5
Picnicking	4
Hiking	3
Water sports	4
Other	13

Camping is the other major activity that is done both for its own sake an as a part of some broader recreational experience. Except for hunting, hiking, and horseback riding, much of the recreation is limited to rather small portion of the forest--streamside, campground, ski area, and so on. Time spent travel- ing plus days at developed sites accounts for 60 percent of the total visitor- days to forest land. Of all those who camped overnight in Federal and State facilities in 1971, 43 percent used a travel trailer, 29 percent a pickup-campe and about 16 percent a tent (Kirkpatrick 1973). Campers were about evenly spli between those who stayed for one or two nights and those who stayed longer (Kirkpatrick 1972).

The third major category of recreation activities in Montana, hunting and fishing, is commonly believed to include opportunities of the highest quality found anywhere. Just as sightseeing opportunities are frequently forest- oriented, so are the opportunities for a variety of popular types of fishing and hunting.

Montana offers 47 species of birds and 19 species of fish, legally classi- fied as game. In addition, there are 12 species of big game, of which 10 are hunted. Several of these species--elk, bear, goat, and moose--are found almost exclusively in forested and high-mountain habitats, as are a good share of both whitetail and mule deer, and bighorn sheep.

Virtually all the harvest of several species of big game and nearly half c the entire State harvest of deer have been on forest land. Harvest has been fairly stable over the past decade, with some year-to-year fluctuations due to changes in regulations, weather conditions, etc., that affect laws and hunter participation. Recorded are 669,000 visitor-days of hunting on National Forest in 1970, a 45 percent increase over 1960, and a 183 percent increase over 1955.

Fish and Game Department data indicate a smaller increase in total number of hunters, but show an increasing proportion of the State's residents are going hunting:

Year	*Percent of residents buying big game licenses*
1950	15
1960	18
1970	22

Montana also ranks third among the States in the sale of nonresident hunting licenses and tenth in nonresident fishing licenses.

We can only estimate the dollar value of recreation and its importance to the State and local economies. One indication is dollars spent on licenses and permits. Out of the total of $4,680,000 spent on fishing and hunting licenses between May 1, 1971, and April 30, 1972, over $2 million can be attributed directly to big game, not counting deer (Montana Fish and Game Commission 1972). If an appropriate share of deer license receipts and of general license fees was added, it would be reasonable to assume at least 50 percent of the State's sportsman fees accrue from hunting on forest lands.

In addition to providing recreation and food for sportsmen, the wildlife resource also provides intangible benefits to those who simply observe. In the 13 southeastern States, for example, the nonconsumptive enjoyment of fish, animals, and birds was found to be more highly valued than were all fishing and hunting experiences combined, based on nearly 10,000 interviews (Horvath 1974).

A 1971 mail questionnaire sent to about 12,000 Montanans (about 50 percent responded) revealed that many Montana residents have a preference for undeveloped recreation areas (Kirkpatrick 1973):

Type of recreation area	*Respondents' preference (Percent)*
Roadless areas characterized by natural wild conditions	15
Largely undeveloped areas where activities such as camping, fishing, and picknicking are common	27
Developed parks and campgrounds	22
Intensively developed areas such as city parks	7
Natural areas with outstanding tourist attractions	16
Historic and cultural sites	13

These respondents also reported they spend over one-fifth of all their leisure time in outdoor recreation and would like to spend even more, most notably in fishing.

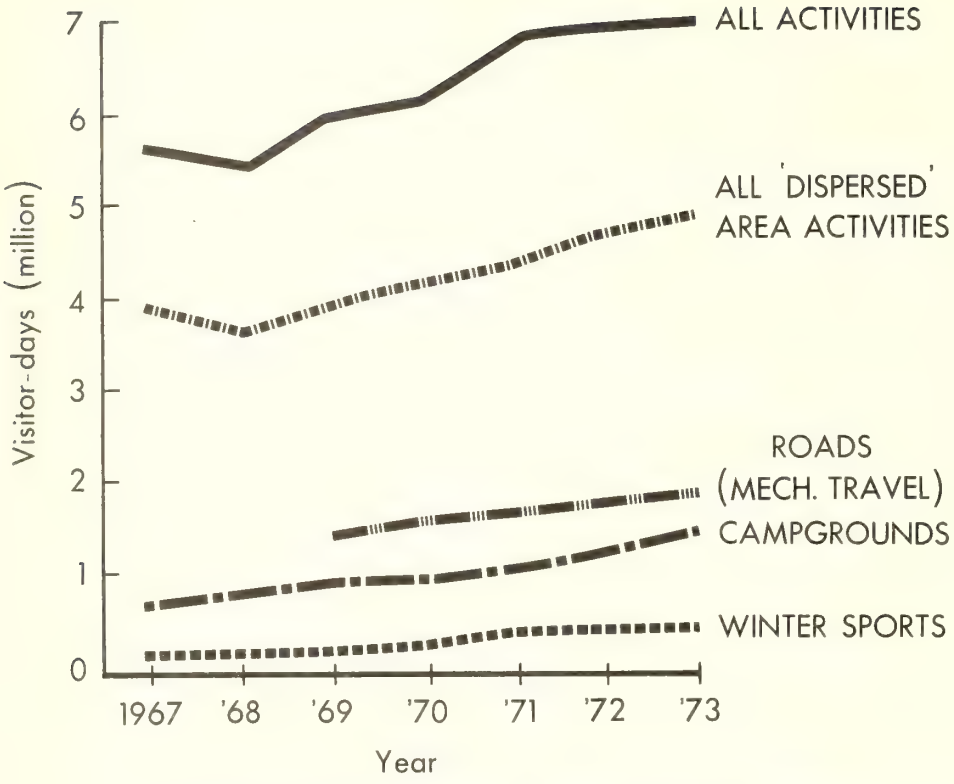

Figure 33.--Recreation visits to Montana National Forests, 1967-1971.

Although data limitations restrict our ability to trace changes over time, several activities have shown real growth in participation. Total recreation visits to National Forests, "dispersed" area uses, campground use, and winter sports visits--mostly skiing (State chairlift capacity has quadrupled in the last decade)--have all increased in recent years (fig. 33).

Highly developed, forest-oriented recreational subdivisions are also found in mountain areas and along rivers and lakes. In an area starting around Billings and extending west and north, there are several major mountain subdivisions. The best known of these is the $20 million Big Sky development in Gallatin County, which is expected to ultimately cover 10,000 acres. Included are a golf course, ski area, and 1,200 condominiums and residential home sites. In contrast, the densely developed $20 million Ptarmigan Resort area in Whitefish is expected to put a hotel, 500 condominium units, and 100 residential lots on a 457-acre tract. There are also numerous subdivisions that offer unimproved raw land, such as two 10,000- to 12,000-acre developments by Reforestation, Inc., located in Musselshell and Powell-Granite Counties (USDA State Committee for Rural Development 1973).

Grazing

In early days of the open range, much of the grassland resource was overgrazed. As the land was brought under management, grazing levels were reduced. Rehabilitation measures and improved grazing management have proved so effective that recently some increases in grazing have been permitted on forest lands. However, continued adjustments, both up and down, are likely to occur as range

inventories are updated. On National Forest land, about 12 percent of the land suited for grazing is presently closed. On private and State forested grazing lands, about 1.4 million acres need forage improvement measures and about 0.7 million acres need reduction or elimination of grazing (USDA Soil Conservation Service 1970). In addition, much of the expansion of towns and development of ranchettes is on privately owned grazing lands.

Currently, there are about 2.8 million cattle and about 1 million sheep in Montana. Total required feeding for this livestock is about 36 million animal unit months (AUM) at 5 sheep = 1 cow = 1 animal unit.

Data from the Bureau of Land Management suggest that about 12 acres of woodland are needed for 1 AUM of grazing (620.3 thousand acres grazed, 51.7 thousand AUM's). On this basis, the 11.5 million acres of grazable woodland would provide about 1 million AUM's, or about 3 percent of total livestock feeding requirements. Based on estimated values of grazing, this represents about $20 million to the local economies. Although forest land grazing does not appear to provide a large portion of total grazing needs, it does provide a vital part of grazing in local areas, and values of grazing permits are often capitalized into values of farms and ranches.

Although it is sometimes necessary to keep livestock out of timber harvest areas until trees have regenerated, there may be up to 20 years of grazing available in recently harvested areas under some conditions (Basile and Jensen 1971).

Mining

In 1972, of a total of 250,000 mining claims on the National Forests in Montana, there were about 20,000 active claims, which often have a major local impact on forest cover and other forest values. The claims are distributed approximately as follows:

National Forest	*Number of active claims (1972)*
Kaniksu	4,000
Beaverhead	3,300
Lolo	3,200
Kootenai	2,700
Gallatin	1,900
Deerlodge	1,600
Helena	1,500
Custer	800
Lewis and Clark	400
Bitterroot	300
Flathead	50

Claims average about 20 acres each, for a total of 400,000 acres directly involved. Only recently have changes in mining laws given the Forest Service much authority over the disposition of timber on mining claims.

About 350 oil and gas leases have been taken on forested land. The leases involve a total of about 65,000 forested acres, most of it on the Custer National Forest in eastern Montana.

Recent interest in the vast coal reserves in eastern Montana has led to a debate over the legal and environmental aspects of proposed strip mining. In total, there are about 800,000 acres of coal-bearing land in the area, which constitutes about 13 percent of the Nation's coal reserves (Copeland and Packer 1972). However, only a small portion of this is considered currently available and suitable for mining, probably 120,000 acres over the next 50 years (Coordinating Committee, North Central Power Study 1971). These are primarily the low-lying areas along valley and stream bottoms, where the overburden that must be removed is shallowest. Presently, about 300 to 500 acres per year are being mined.

About 10,000 acres of coal deposits are on National Forest land; about 1,000 acres are in forest cover, primarily ponderosa pine. Timber values are not high in these dry, scattered stands, but the trees may provide important wildlife habitat and recreational uses.

The National Forest lands, and also similar lands outside National Forests, are locally important for livestock grazing, wildlife habitat, and recreation. Sites now being stripped for coal are the low-lying bottoms and rolling grasslands that provide winter grazing. On private lands this is also where ranch headquarters are located.

Several key issues concern public land managers and private landowners in the areas proposed for coal development:

1. The coal seams are sometimes aquifers, which if disrupted may affect movement, rate of recharge, and quality of water, and may have an impact removed from the actual mining sites (Montana Coal Task Force 1973).

2. The areas involved have important grazing, wildlife, and esthetic values. The technical and economic feasibility of returning mined lands to a desirable condition must be taken into account. Until cover is reestablished, grazing is impossible and wildlife will be displaced.

3. Over some of the coal beds the deeper soil is high in sodium which can prevent reestablishment of vegetation unless covered with fertile topsoils.

4. Erosion and sedimentation may occur, including both water-related erosion and dust from mines and from railroads, if the coal is transported from the areas.

Climatic conditions in eastern Montana, particularly the limited precipitation, make revegetation of mined lands difficult (Montana Coal Task Force 1973). Successful rehabilitation may demand land shaping, seedbed preparation, seeding, fertilizing, soil additives, water and sediment control, soil surfacing, and shrub or tree planting. Protection against insects, rodents, livestock, and big game may be required. Direct rehabilitation costs ranged from $700 to $1,800 per acre in 1974. At most, this might add a few cents per ton to the price of coal (Packer 1974). Techniques of rehabilitation and the protection of environmental values, as well as the economic and social trade-offs involved, are all under active study.

CHAPTER V

ENVIRONMENTAL ASPECTS OF FOREST USE

For convenience of presentation, the uses of individual forest resources have been discussed separately. In fact, though, rarely can one resource be utilized without generating direct and subtle impacts upon other elements of the forest ecological community.

In this chapter we discuss the principal environmental concerns surrounding two major forest uses in Montana, production of wood products and recreation, and two approaches being taken to minimize undesirable impacts. Much of this discussion is based on expert opinion simply because data do not exist on the relationships among forest uses and the forest environment.

Timber Harvesting and Road Construction

Commercial timber harvesting and the attendant road construction are the major man-caused disturbances of forest ecosystems.

The basic methods for harvesting timber are: (1) clearcutting, the removal of all trees in large blocks, patches, or strips; (2) seed-tree cutting, a clearcut with seed trees reserved as scattered individuals, groups, or strips; (3) shelterwood cutting, leaving a portion of the stand until seedlings are established; (4) group selection, many small clearcuts (1 to 5 acres) that are allowed to reproduce before further cutting in the residual stand; and (5) single stem selection, the harvesting of single trees.

Each harvesting method affects other values and uses of the forest. Shearer (1971) has compared the alternative cutting methods for one major timber type in western Montana, western larch, and has broadly judged the most desirable method relative to its effect on other forest uses as follows:

Consideration	*Most desirable type of harvest*
Esthetic attraction	Minimum disturbance
Livestock and big game forage production	
--quantity	Clearcutting
--use	Group selection to create small openings
Timber production	Clearcutting
Water production	
--quantity	Clearcutting
--quality	Minimum disturbance
Soil protection	Minimum disturbance

Notice in the above listing that, although clearcutting in western larch may produce the most big game forage, small open patches will be used most intensively. Clearcutting in small areas provides the most forest-edge habitats and favors some species. On the other hand, those species dependent upon unbroken forest cover may not prosper (Webb 1973).

Road systems that usually accompany logging may also severely and suddenly disrupt wildlife populations. Roading increases management opportunities when access is needed to distribute hunting pressure, but without adequate management controls roads can lead to a deterioration of hunting quality (Stankey and others 1973). Similarly, logging roads can destroy the habitat of some species and can, in conjunction with timber harvesting, create a variety of habitats favorable to other species. Whether to close roads or to keep roads open after timber harvesting is often a difficult choice for resource managers responsible for providing a variety of opportunities for hunters and other recreationists.

The forest lands of Montana offer a tremendous range of recreational opportunities, which have varying compatibility with timber production (School of Forestry, University of Montana 1972). Timber management can be modified to enhance recreational and esthetic resources. Timber stands in campgrounds and picnic areas can be selectively cut to remove individual trees that either are safety hazards or that prevent the desired pattern of facility development. Carefully planned cutting can open up scenic vistas along roads and trails; cuttings and subsequent regeneration can add variety to monotonous, even-aged, single-species stands.

With careful planning, large expanses of forest land can often include intensive timber management without impairing recreation values. In sensitive scenic and recreation areas, clearcutting may be undesirable. But elsewhere it may be a suitable method if small cuts are used and if cutting-unit boundaries blend with natural features. New logging techniques, including some that require fewer roads, are being introduced to minimize visual scars and ecological impacts of timber removal.

In still other situations, recreational and other noncommodity values are so high that timber harvesting should be precluded. Such is the case in Wildernesses, where Congress has said through law that the values of timber harvesting will be foregone.

Most frequently of all, timber production is modified to protect other resources. Such trade-offs are now the rule rather than the exception in Montana's forests. For example, harvest on National Forest lands has changed from virtually all clearcutting to currently over half partial cuttings, for both esthetic and environmental reasons.

Timber management cannot be described as categorically good or bad for recreation. Its impact depends on the extent and quality of study and planning given to each management decision and on sensitivity to various values in carrying out the program.

Road construction has often been a prime cause of soil movement and the subsequent silting of streams (Stone 1973). Physical characteristics of the land, engineering techniques used in construction, and the proximity to streams are all critical factors (Packer 1967). Currently, extensive reconnaissance inventories and mapping of fragile and unstable areas are underway to minimize undesirable consequences of roads. This work, based on studies of geology, vegetation, water, and soil, is aimed at determining just how much or how little disturbance forest lands can withstand (Layser 1974). One study indicates that a portion of the timber-producing areas on each of five National Forests should be deferred from use until thorough examinations can be completed (Wikstrom and Hutchison 1971).

On forest land where timber production is a primary management objective, highly productive soil may also be highly erosive. A sensitive approach emphasizes logging methods that disturb the ground surface very little, such as those using helicopters, overhead cable systems, or even horse logging. Full-tree logging to concentrate slash and reduce fire potential or using in-the-woods chippers to reduce air pollution also can minimize environmental disturbance.

In the construction of forest roads, ecologically sensitive management might dictate that the shortest distance between two points is not necessarily the best route. A road that conforms to the topography is generally preferred to a more direct road with huge cuts and fills. This might mean not only a road that rests more lightly on the land, but also one that is less costly to build. The same philosophy leads to fewer roads on a given area.

Some of these harvesting and road construction measures have already been adopted out of concern for the environment and can be found in any environmental impact statement concerning forest management. Case studies in Wyoming and Idaho found that current timber harvesting practices cost 24 and 10 percent more, respectively, than the practices followed 10 years ago (in constant dollars). The major reasons for these increases were intensified slash disposal, an increased reliance on artificial regeneration, and greater costs required to properly prepare and administer sales (Kemper 1974). In addition to higher costs for extracting timber, portions of the timberland base in Montana are only producing a fraction of the wood products that would have been produced a few years ago. These are the costs of providing a forest environment acceptable to the public.

Controlled fires are used extensively in timber management to reduce the occurrence of major conflagrations and to provide favorable growing conditions for commercially valuable tree species. While there is no convincing empirical evidence that the resulting smoke is harmful either to humans or to plants, it is a highly visible source of air pollution (Hall 1972). For example, lands administered by the Forest Service in the Missoula area have been cited as the source of substantial quantities of particular matter in the air (School of Forestry, University of Montana 1972).

Woody debris is broadcast burned or piled and burned on about 100,000 acres of forest land in the Northern Rocky Mountains each year (fig. 34). Forest managers strive to burn when winds and other atmospheric conditions

Figure 34.--Prescribed fire in the Northern Rockies. Forest managers strive to burn when atmospheric conditions will carry smoke away from populated areas.

provide maximum dispersions of the smoke. These fires have the following characteristics (Roe and others 1971):

1. Remote from urban-industrial problem areas;
2. at a relatively high elevation in mountainous terrain and well above inhabited valleys where air motion is most restricted;
3. large enough to produce strong convection columns that transport most smoke several thousand feet above the fires; and
4. of limited duration so the continuous hazes characteristic of low-elevation, urban, and industrial sources are avoided.

Given trends in increasing utilization of wood materials, available mechanical treatments and controlled burning techniques, it is possible to manage smoke so that the air quality where people live and spend their leisure time is protected.

Clearcutting and burning do increase overland water flows and soil erosion and cause very small losses of plant nutrients. Studies in western Montana, however, indicate that vegetative growth generally returns such areas to near prelogging conditions within a few years (DeByle and Packer 1972).

Wood Processing and the Environment[4]

In some areas, wood processing firms are located in valleys that act as inversion basins prone to air pollution during part of the year. Libby is a prime example; strong inversions are frequent and winds are very light. The nearly total stability of the valley air intensifies pollution from the combustion practices of the local lumber industry, from heavy traffic on dusty, unpaved streets, from open burning of trash, and seasonally from slash burning.

In the Missoula area, the Hoerner Waldorf Corp., the Intermountain Lumber Co., and the Evans Products Co. have each been cited as emitting 100 tons or more of particulate per year. Air sampling by the Missoula County Health Department in 1970 revealed that outside the county courthouse the suspended particulate level exceeded the maximum permissible annual mean concentrate. Less extensive measurements taken at other stations in 1971 suggested that particulate concentrations had been reduced and were below the Federal standard.

The first bill to regulate air pollution was introduced into the Montana legislature in 1963 and the Clean Air Act of Montana became law in 1968. In the next year, the Montana State Board of Health adopted basic regulations covering air pollution control and abatement activities and there have been a number of modifications since that time. Within a few years, most wood products firms were operating within these requirements.

A 1968 survey by the Montana Department of Health and Environmental Sciences revealed 88 tepee burners in operation statewide, none of which were capable of meeting State emission standards. By May 1970, 54 burners remained and were being examined for compliance. At the beginning of 1972, 48 burners were still operating, of which 8 were not always in compliance with regulations.

In 1971, 28 companies that responded to a statewide questionnaire reported a total of 29 tepee burners operating prior to 1968. Of these, 12 burners had been modified and 5 replaced by new burners; 7 had been eliminated by boiler systems, 4 by landfills and other uses, and 1 by mill closure.

The costs of meeting State requirements varied tremendously, from a low of $1,600 for modifying a small tepee burner to a high of $1.5 million for replacement of a boiler system. Installations are being further refined to comply with State or county regulations. (For a discussion of tax incentives as a means to encourage pollution control in the wood products industry, see Vaughan 1974).

Prior to construction of the pulp and paper plant in Missoula in 1957, a major share of Montana's residues from lumber and plywood mills was unused and disposed of by burning. With the pulp plant in operation and production increasing, utilization of residues, excluding bark, increased from 28 percent in 1962 to 74 percent in 1969. Approximately 63 percent of all mill

[4]In part, adapted from Western Wood Products Association (1972).

residues, including bark, were used in 1969. With the recent construction of the fiberboard plant at Columbia Falls and the possible future construction of another particleboard plant at Bonner, residue utilization will probably increase further and the burning of residues should continue to decline.

In the last several years, considerable research has been concentrated on the "blue haze" caused by the emissions of dryers in plywood, particleboard, and fiberboard plants. When such dryers are located near plants giving off wood smoke and sulfur, the dryer emissions can act as catalysts to create sulfuric acid in the atmosphere, one of the most hazardous of all air pollutants. Fortunately, current technology is adequate to control these emissions. The State's particleboard and fiberboard plants are said to have had the most advanced air pollution control measures incorporated into their construction.

Hoerner Waldorf's pulp and papermill has probably been the center of more angry comments than any other plant in Montana. These comments have centered both on the odors and the potentially hazardous emissions of the chemical processes (for example, see Carlson 1974). The firm has been engaged in an air pollution control program since 1970. Although it is not currently meeting emission standards and is operating on a variance, the firm has stated that it expects to overcome the problems in the near future.

Meeting State water quality standards has been less of a problem for the wood products industries than meeting air standards. Water quality tests as required for Federal discharge applications have been made and, where necessary, weekly measurements are taken.

Outflows from log storage ponds have generally been brought into compliance with legal requirements by constructing settling ponds and trash racks. Secondary treatment or chlorination of sewage disposal plant outflows has also been instituted. One operator filled his pond and went to dryland storage; in another instance, separate storm sewers were constructed. Most of the plywood plants and sawmills are recycling the waste waters used in their processes. The pulpmill has recently increased its holding pond capacity and has installed clarifiers; water discharges now meet State standards.

Impacts of Recreation on the Forest

Montana's forest-related recreation resources are outstanding in both extent and quality. Over the years, many components have been altered by use.

The chief cause of changes has been simply too many people treating the land too roughly. Even within legally protected Wildernesses, many main trails and campsite areas are characterized by badly deteriorated soil and vegetation. The cause of the problem is illustrated for the Mission Mountains Primitive Area in figure 35. Visitor counts show that use is concentrated in just the areas around three entry points. In the Bob Marshall Wilderness, a more widespread pattern of use still suggests that most people do not venture far from a few principal trails (fig. 36).

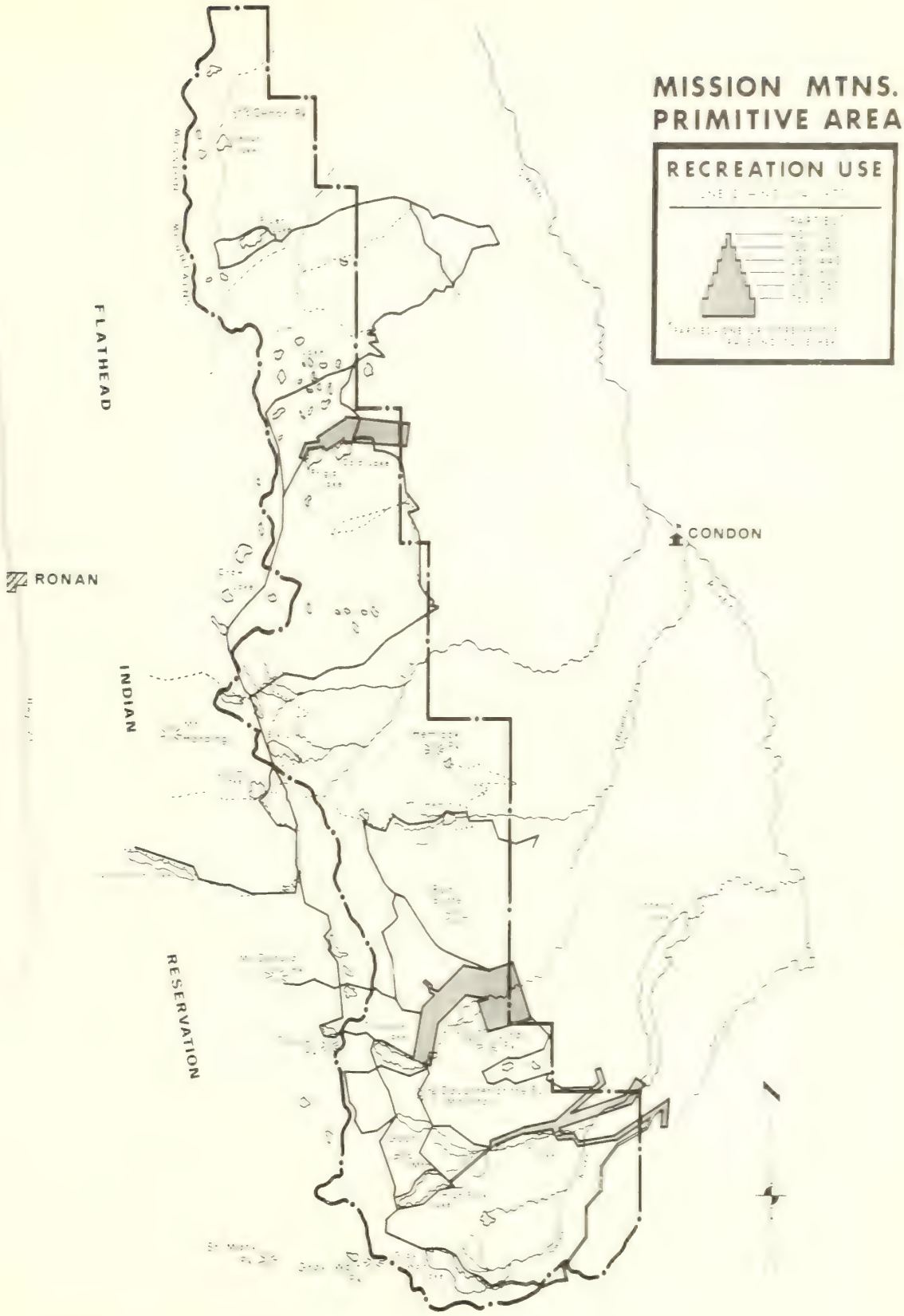

Figure 35.--Patterns of use in the Mission Mountains.

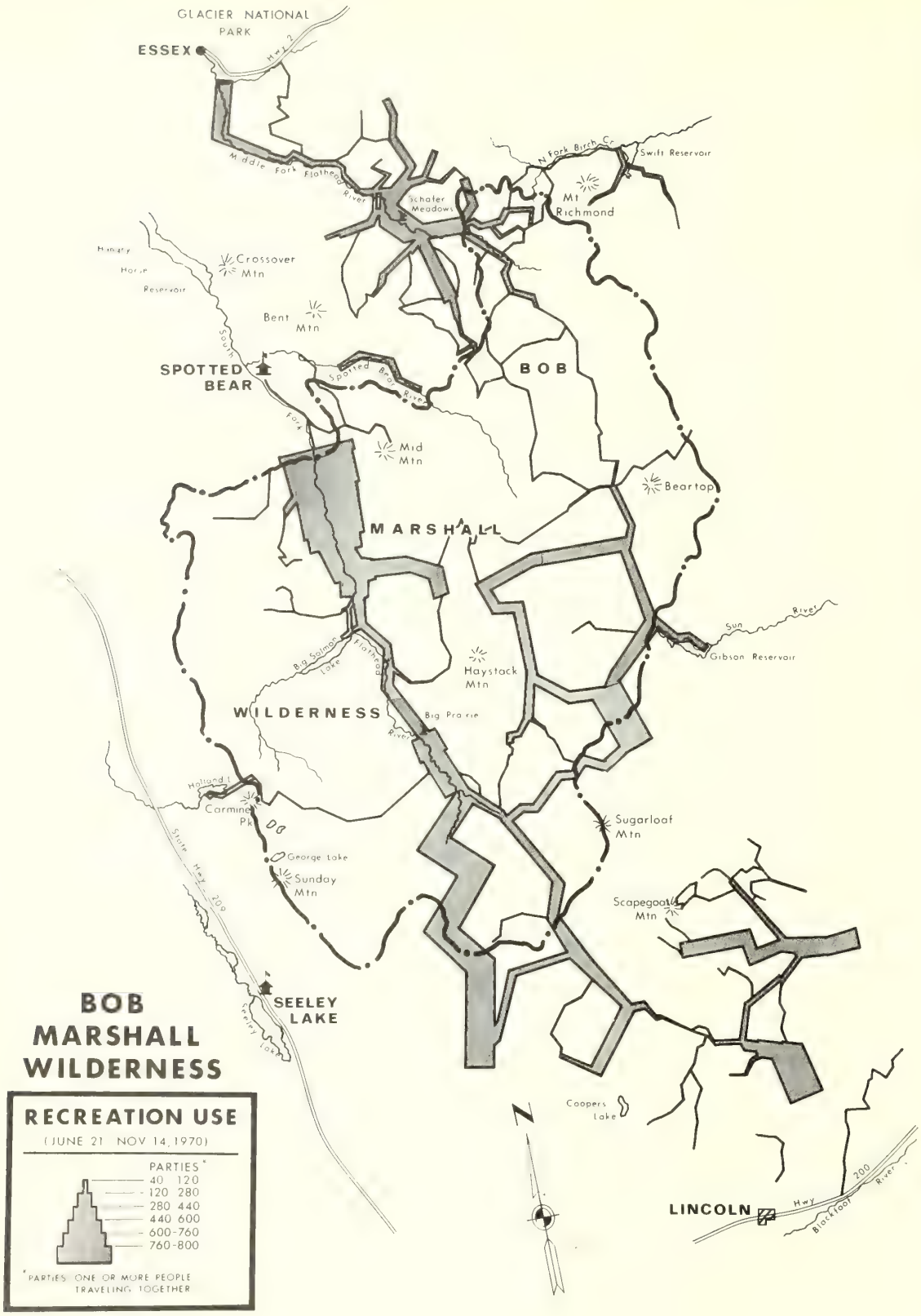

Figure 36.--Patterns of use in the Bob Marshall Wilderness.

It has been found that visitors use only a small proportion of the established trail systems in such areas. In the Spanish Peaks Primitive Area, for example, about two-thirds of all visitor travel occurs on one-fifth of the available trails (fig. 37). As one might anticipate, horse riders spread out more than do hikers. The use by all visitors is even more concentrated in both the Bob Marshall and the Selway-Bitterroot Wildernesses (Lucas 1974).

An important perspective on these use patterns is offered by the Wilderness Act of 1964, which defines solitude as a major quality of Wildernesses. But the quality of solitude, much as the physical resource itself, is fragile and easily degraded. Increasing congestion threatens the continued ability of visitors to find solitude. In addition, conflicts between different types of users--hikers and horsemen, large parties and small--are often serious problems (Stankey 1973).

To protect the intangible values of Wildernesses and to protect the physical resource itself, a redistribution of users seems necessary. Limits on numbers, methods of travel, and other activities appear inevitable in those areas where use pressures are increasing most rapidly (Hendee and Lucas 1973).

Another kind of use pressure that has changed the nature of the recreation resource is the demand for fishing in high-mountain lakes. Naturally low nutrient levels have led to fragile aquatic ecosystems producing few fish. Artificial stocking with brook trout, rainbow, and yellowstone cutthroat, even in Wildernesses has sometimes been to the disadvantage of native species.

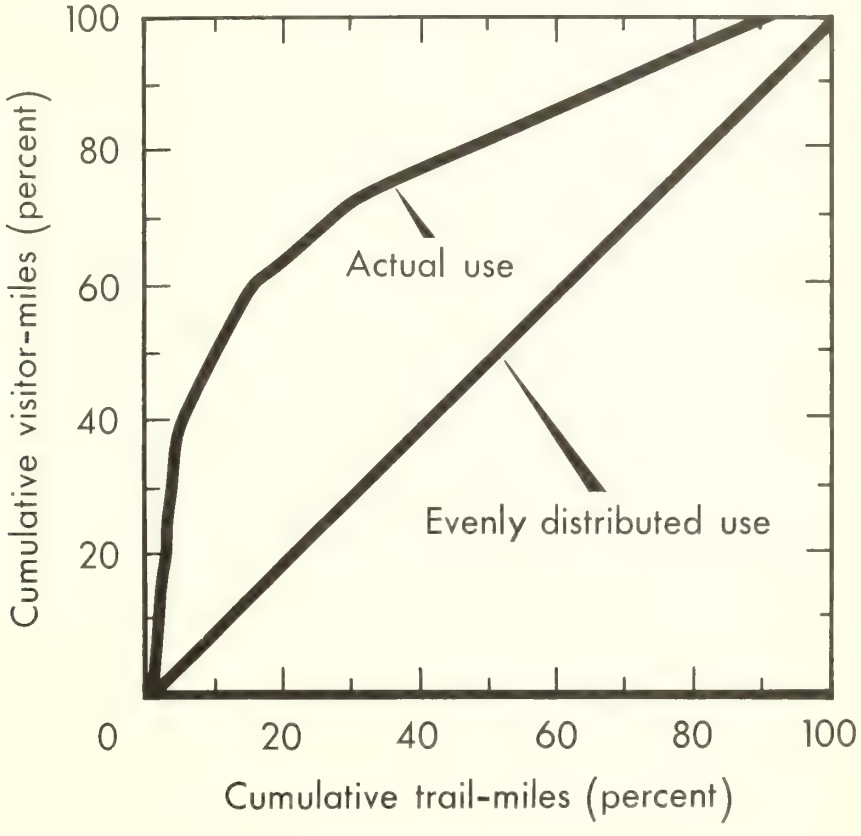

Figure 37.--Concentration of use in the Spanish Peaks Primitive Area, 1970.

Meeting the requirements of recreational visitors for overnight accommodations, sanitary services, solid waste disposal, parking space, etc., without degrading air, water, land, and biotic quality is a great challenge to public land managers and to private enterprises. The creation of very large, intensively developed recreation complexes clearly poses these problems (Nielsen and others 1973).

A more widespread problem of this nature is posed by the proliferation of subdivisions, frequently on the fringes of forested lands. For example, the Montana Fish and Game Commission judged that of 93 subdivision impact statements reviewed by the end of 1973, more than a third were directly detrimental to wildlife. From 1967 to 1972, approximately 9,000 acres of big game winter range was subdivided in Flathead County alone (Woodgerd 1974).

Another kind of problem exists in areas where black bears and grizzly bears are quick to take advantage of available food or garbage. Conflicts between humans and animals usually have been resolved in favor of humans. Restricting or removing animals has reduced the naturalness of the forest environment; to favor such animals would require restricting human use of that same environment. The best choice has not always been clear.

Forests have suffered from off-road use of recreation vehicles and from recreation-livestock grazing, especially in the vicinity of fishing lakes. Off-road traffic on unsuitable terrain and soils, notably in alpine areas, has necessitated closure of several areas to motorized vehicles. The problem is so severe that some National Forests recently announced rules to regulate off-road vehicles.

Snowmobile use has also increased tremendously in the last 5 years and in some locations is alleged to have adversely affected both vegetation and wildlife. In addition the noise of snowmobiles reduces the quality of the recreational experience for some users. One solution to these kinds of problems has been to set aside special areas and trails for snowmobiles.

Ecosystem Classification to Minimize Environmental Problems

To help forest managers better understand the environmental implications of their activities, widespread classifying and mapping of Montana's forest ecosystems are underway on public lands (USDA Forest Service 1973c). A related objective is to provide a basis for defining the potential productivity of the land for a range of products and services.

Ideally, the forest land itself, and the vegetative and water systems on that land would each be carefully studied, classified into homogeneous pieces, and mapped. In Montana, a method for classifying the vegetative systems of forest lands was completed in 1974; vegetative systems of the National Forests will be mapped by the end of the decade. Classification and mapping of the land system and, to a lesser extent, of the aquatic systems, are also underway.

Identifying and mapping the land system are necessary as a basis for predicting the results of management activities. For example, soil and slope interrelationships can be interpreted in the following terms:

1. Erodibility, land stability, compactibility, moisture handling characteristics, and soil temperature;

2. suitability for land treatment practices, such as establishing vegetation, or road and trail construction; and

3. subsurface moisture characteristics that may be important for road and dam construction or for drainage and sanitary facilities.

These interpretations are expressed as qualitative hazard ratings, based on the limited quantitative data that are available, and on the expert judgments of experienced soil scientists.

Classifying the vegetative system is useful in formulating a basic understanding of potentials and responses to vegetative manipulation. When combined with knowledge of land systems, the forest manager can estimate productive capacity, limitations and opportunities, and responses to a wide variety of land management alternatives.

Two systems are being developed for rating management implications of habitat types, the basic unit for vegetative classification in Montana (derived from Pfister and others[5]). One system centers on silvicultural considerations, such as the best cutting methods and regeneration techniques, as illustrated for several extensive habitat types in Montana in table 5. The other system develops potential productivity ratings for several different forest resources (table 6).

The same vegetative classification work has also provided at least a partial basis for understanding the role of wildfires in the forest and the susceptibility of various species to some forest insects and diseases.

By identifying critical physical characteristics of aquatic systems on forest lands, certain guides for forest management activities can be developed. For example, the importance when logging of leaving streamside trees to shade fish-producing areas will vary by type of aquatic system. Identification of the type of system permits the construction of specific management guidelines.

Productivity of the aquatic system frequently depends more on what is done to the land and vegetation than what is done to the aquatic system itself. Erosion of unstable soil, including streambanks, can be accelerated by road construction, logging, livestock grazing, wildlife use, etc., thereby reducing aquatic values.

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[5]Pfister, Robert D., and others. Forest habitat types of Montana. Intermountain Forest and Range Exp. Station, Ogden, Utah. (Manuscript in preparation.)

Table 5.--*Silvicultural implications of selected habitat types*

Habitat type Climax tree/undergrowth	Recommended silvicultural systems	Probability of natural regeneration success		
		Without scarification or prescribed burning	With scarification	With prescribed burning
Pinus ponderosa/ Festuca idahoensis (Ponderosa pine/Idaho fescue)	Selection	Low	Low to medium	Low
Pseudotsuga menziesii/ Physocarpus malvaceus (Douglas-fir/Ninebark)	Shelterwood Clearcutting	Low to medium	Medium	Medium
Abies lasiocarpa/ Clintonia uniflora (Subalpine fir/Queen cup beadlily)	Shelterwood Clearcutting	High	High	High
Abies lasiocarpa/ Zerophyllum tenax (Subalpine fir/Beargrass)	Selection Shelterwood Clearcutting	Low	Medium	Low to medium

Table 6.--*Relative productivity ratings for selected habitat types*

Climax tree/ undergrowth	Timber productivity	Wildlife winter use	Livestock forage production	Total water yield	Esthetic recovery after disturbance
Pinus ponderosa/ Festuca idahoensis (Ponderosa pine/Idaho fescue)	Low	High	High	Low	Low
Pseudotsuga menziesii/ Physocarpus malvaceus (Douglas-fir/Ninebark)	Medium to high	High	Low to medium	Low to medium	Medium to high
Abies lasiocarpa/ Clintonia uniflora (Subalpine fir/Queen Cup beadlily)	High to very high	Low to medium	Low	Medium to high	High
Abies lasiocarpa/ Zerophyllum tenax (Subalpine fir/ Beargrass)	Low to medium	Low	Low	Medium	Low to medium

Land Use Planning to Determine Forest Use

On the National Forests, which include nearly three-quarters of the forest lands in Montana, land and vegetative classification and mapping for land management planning are done by an interdisciplinary team. In Montana, planning units have been relatively small, but are being increased to 200,000 to 300,000 acres each. Planning proceeds simultaneously for all outputs, so that production of timber, wildlife, and recreation, for example, is coordinated from the start, and the development or preservation of all resources is done within the same planning horizon.

As a basis for the planning process, the following minimum steps are involved.

1. The local, regional, and national publics are informed of the process to be followed and are encouraged to participate.
2. Existing resources are defined, such as timber, forage, wildlife habitat, recreation sites, and trails and roads.
3. Basic data are gathered on geology, soils, hydrology, and land and vegetative classes.
4. Particularly sensitive areas that must be carefully handled are defined, including erosion and landslide hazards, unique features or resources that require protection and highly visible areas.
5. Given the existing conditions and constraints on development, the potential production of each resource is defined.

For nearly any land area, a variety of resource use combinations can be favored. Accordingly, the planning team defines a variety of options as alternatives for managing that forest area.

These alternatives are then presented for public consideration. The resulting public comments are assigned substantial weights in the choice of a management strategy. After a tentative decision has been made by the Forest Service, a draft environmental impact statement that documents the study procedure and the management alternatives is circulated for review and possible revision as required by the National Environmental Policy Act.

The above process is routinely used by the Forest Service, and some variation is common to other public agencies. In addition, private industry is giving increasing attention to environmental effects of their own activities. This is due to laws, as in the decline of tepee burners, and due to a recognition that public acceptance is important to success--as in the case of the voluntary issuance of an analysis of environmental and economic consequences of a proposed expansion of the State's only papermill (Hoerner Waldorf 1973).

A pilot study of land capabilities is underway by the Department of Natural Resources and Conservation. The study will develop a methodology which can be used by State and local planning staffs to assemble and interpret data concerning land and natural resources so that information can be utilized for land use planning. (USDA State Committee for Rural Development 1973).

CHAPTER VI

THE ECONOMIC SIGNIFICANCE OF FOREST RESOURCES TO MONTANA

All forest resources discussed in this report have economic value because their development or preservation has the potential to change economic activity. Because commercial timber has the greatest economic value by far, the focus here is on that resource. After describing timber-dependent employment and income in Montana, we discuss the implications of changing harvest levels and then provide a broader perspective on timber harvesting in Montana and in the Nation.

Employment and Income

Forest resources are one of the most important sources of economic strength in Montana. From the late 1950's to 1970, the numbers of employees in the commodity-producing industries have been shrinking, while those in the service industries have been increasing (Johnson 1972):

Sector	*Changes in annual employment from 1950 to 1970 (Percent)*
Agriculture	-34
Mining	-35
Wood products	61
Other manufacturing	33
Total, commodity	-19
Total, services	33
All employment	14

In the commodity-producing group, the wood products industry has created the most new jobs (trends are shown in figure 38):

Sector	*Annual average employment*		
	1950	*1960*	*1970*
Agriculture	52,800	39,200	34,800
Mining	10,200	7,900	6,600
Wood products	5,400	7,400	8,700
Other manufacturing	12,600	13,200	15,200
Total, commodity	81,000	67,700	65,300
Total, services	147,500	169,200	195,700
All employment	228,500	236,900	261,000

In 1971, 11 counties in Montana had at least 100 employees in the wood products industries as shown in table 7. In aggregate, these counties accounted for about 93 percent of all wood products employment and earnings in the State in that year.

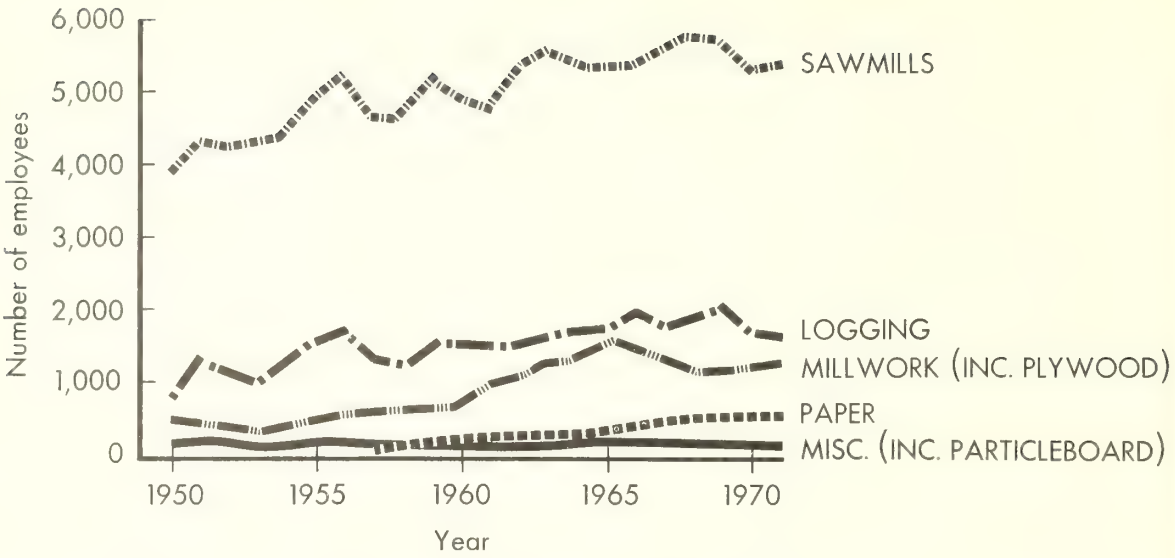

Figure 38.--Timber-dependent employment in Montana, 1950-1971.

In 1971, the average earnings of wood products employees in Montana (including those who worked just part of the year) were $8,260. This was a 31 percent increase over 1967 earnings, an increase slightly greater than for this industry nationwide.

Table 7.--*Montana counties with more than 100 employees in the wood products industries, 1971*

County	Number employees in wood products industries	Wood products employment as percent of total county employment	Average annual wages and salaries per employee in the wood products industries
		Percent	*Dollars*
Missoula	2,911	14	8,900
Flathead	1,849	15	8,100
Lincoln	1,575	27	9,100
Sanders	513	23	7,800
Gallatin	360	3	6,800
Ravalli	359	12	7,500
Lake	307	10	7,500
Mineral	264	27	8,100
Powell	187	9	7,600
Meagher	119	19	6,200
Granite	100	14	6,600

Table 8.--*Earnings of the Montana male workforce for selected industries, 1969*[1]

Sector	Proportion working 50-52 weeks	Median earnings of employees working 50-52 weeks	Earnings as proportion of U.S. earnings all employees
	Percent	*Dollars*	*Percent*
Forestry and fisheries[2]	64	9,634	126
Logging	48	8,582	170
Sawmills, millwork	69	7,716	123
Misc. wood products	57	6,976	118
Paper and allied products	79	9,820	115
Agriculture	77	5,211	115
Mining	74	8,357	95
Construction	56	8,429	99
Total Montana	73	7,669	91

[1] Tables 188 and 185, Census of Population, Characteristics of the Population: Montana, 1970. U.S. Department of Commerce, Washington, D.C.

[2] In this category 90 percent are Federal, forestry-related employees.

Overall, Montana males earned only 91 percent as much as their U.S. counterparts; in contrast, in agriculture and forestry-related industry they earned more than the average wage (table 8). The same kinds of relationships hold for female employees. For females working 50-52 weeks, earnings in sawmills and millwork were higher than in any other industry in Montana and much higher than the national average.

The total of these industry earnings made up 3 percent of all personal income in Montana and about 14 percent of personal income in western Montana, including Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sanders Counties (Johnson 1972). If the sum of employment in agriculture, mining, manufacturing, railroads, and the Federal Government is accepted as an estimate of primary employment--the source of dollars to the State--and all other employment as derivative or dependent, the total direct and indirect personal income dependent upon the wood products industry can be calculated. Best estimates of these totals are about 11 percent statewide and more than 50 percent in western Montana, as shown in figure 39.

Federal civilian employment has been particularly important in Montana in recent years. Between 1950 and 1970, this employment increased 43 percent--nearly 12,000 employees or 4.5 percent of the total workforce--in the later year.

In fiscal year 1972 there were about 2,500 Forest Service employees in Montana, three-fifths of whom were permanent, full-time workers. About 1,000 worked in Missoula County at the Northern Region headquarters, the Lolo National Forest, and two laboratories of the Intermountain Forest and Range Experiment Station. Another 800 were headquartered in Ravalli, Flathead, and Lincoln

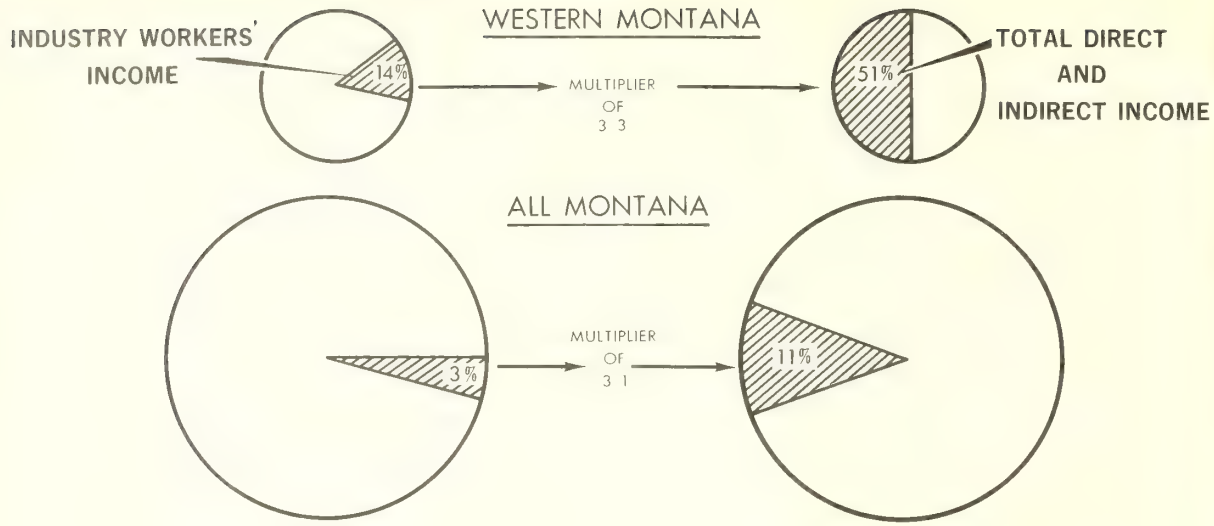

Figure 39.--Proportions of personal income attributable to the wood products industry in western and in all Montana, 1969.

Counties. These employees were involved in managing all of the forest resources not just timber. The $28 million they received in wages and salaries was about one-third as much as the earnings of all employees in the wood products industry When payments received by all forest-related employees of the State and other Federal agencies and by employees of the tourist industry are considered, counting only the wood products industry employment seriously underestimates the contributions of the forest resources to Montana's economy.

Workforce Characteristics[6]

Employment in the wood products industry is concentrated in those occupations which, on the average, are characterized by the least formal education. A quarter of all employees are classified as laborers, which is the largest proportion of any of the manufacturing industries.

The workforce of the wood products industry is relatively young, with only a small portion over age 45 (table 9). Sawmills and millwork plants, which include plywood production, and paper and allied products firms have comparatively young workforces.

The industry's dependence both on weather conditions and on seasonal employees is reflected in the proportion of employees who work year-round (see table 8). These proportions are about the same as for the United States as a whole. The seasonal nature of employment for wood products, for the construction industry, and for lodging (highly tourist-dependent), is pictured in figure 40.

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[6]Abstracted from a forthcoming publication by Intermountain Station entitled "A profile of forest industry employment in Montana" by Richard L. Porterfield.

Table 9.--*Age distribution for selected industries, 1970*[1]

Sector	Proportion of Workforce			Median age
	16-24 years	25-44 years	over 45 years	
	Percent			*Years*
Forestry and Fisheries[2]	24	48	28	35
Logging	12	54	35	39
Sawmills, millwork	16	48	36	38
Misc. wood products	23	32	44	43
Paper and allied products	10	67	22	35
Agriculture	15	34	51	45
Mining	14	44	41	41
Construction	11	48	41	41
Total for Montana	18	41	41	41

[1] Source: Table 187, Census of Population, Characteristics of the Population: Montana, 1970. U.S. Department of Commerce, Washington, D.C.

[2] In this category 90 percent are Federal forestry-related employees.

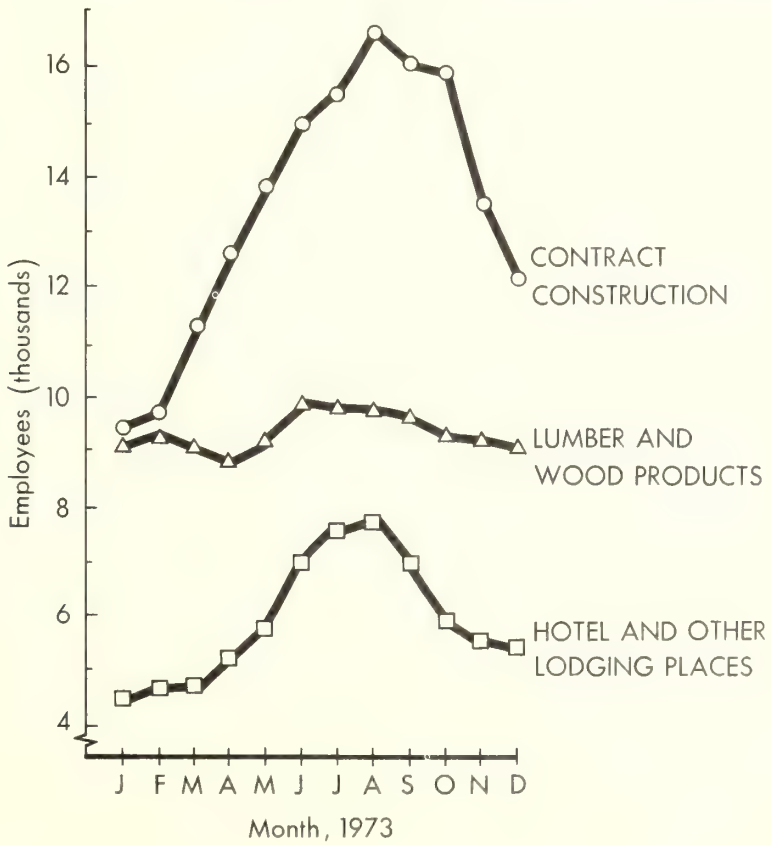

Figure 40.--Employment by month for selected industries.

Employment in the timber industry is hazardous. In 1972, 10 of 56 work-related fatalities in Montana occurred at logging or sawmilling operations, including 5 that were due either to falling trees or logs. The workmen's compensation program pays compensation and hospital, medical, and burial benefits for these and other injuries. Each industry is assessed a basic rate per $100 of payroll which depends on that industry's safety record in the preceding 5 year (a number of large organizations, such as Montana's pulpmill, have established comparable, self-insurer funds). Rates for fiscal year 1973 included:

	Rates per $100 of payroll (Dollars)
Logging and timbering (including contract log hauling)	25.00
Aircraft operation (including dusting, spraying, and stunt flying)	24.50
Underground coal mining	15.25
Sawmills	14.60
Road construction--rock excavation	13.90
Tie, post, and pole yards	8.60
Veneer manufacture	6.95
Planing mills	6.25
Policemen	5.05
Department stores--retail	.70

Logging and timbering has the highest rate of any industry or occupation in Montana.

Local Income From Out-of-State Recreationists[7]

The forest resources also contribute directly to Montana's economy by attracting recreationists who spend money within the State. The expenditures by out-of-State tourists, some portion of whom are attracted by the forests, are infusions to the State's economy. Although the data on such expenditures are fragmentary, we can crudely estimate their magnitude.

Our best estimate is that about 3.7 million tourists visited Montana in 1971, and they spent an average of somewhat less than $40 each during slightly more than 3 days (unpublished updating by Montana State Highway Commission of Wallace and Blake 1966). Allowing for increased prices, then, suggests that total out-of-State tourist expenditures now exceed $150 million per year.

Of this total, some portion is contributed by campers, hunters, and fishermen. In 1969, about 400,000 of the total number of tourists camped in established campgrounds. In 1973-1974, about 160,000 2-day and 34,000 longer term nonresident fishing licenses and 20,000 nonresident big game hunting licenses

[7]Abstracted from a forthcoming publication by Intermountain Station entitled "A Montana perspective on tourist expenditures" by Paul E. Polzin and Dennis L. Schweitzer.

were sold. Recognizing that hunters and long-stay fishermen probably spend much more, and campers much less, than the average tourists suggests that the former kinds of recreationists are responsible for 10 to 15 percent of all out-of-State tourist expenditures.

When tourist dollars are spent for goods and services, the sellers must in turn import much of their merchandise, so the major portion of tourist dollars quickly leaves the State. The following tabulation indicates the "direct" earnings of Montanans from the receipts of groups of firms at least partly dependent upon the tourist industry:

Sector	*Montana earnings per dollar spent*
Motels	$0.21
Hotels	.39
Cafes, restaurants, bars	.27
Food stores	.10
Gas stations	.11
Apparel and accessories	.17
Sporting goods	.15

After allowing for other payments by proprietors for utilities, manufactured-in-Montana goods, and for various services, probably $0.25 or $0.30 of the tourist dollar ends up in the pockets of Montanans. The total direct Montana earnings from out-of-State tourists, then, might be $40 to $50 million annually. Perhaps $5 million of this amount is attributable to campers, hunters, and fishermen.

Local Income From Commercial Forest Lands

In addition to providing employment in wood products and forest management to a substantial number of Montana citizens, the timberlands also provide direct income to the State, to individual counties, and to Indian Reservations:

Source of receipts	*Total 1972 receipts* (Dollars)	*Income to State, county, or tribe* (Dollars)	*Percentage of area of all Montana commercial forest lands*
National Forests	16,570,000	4,140,000	73
Bureau of Indian Affairs	4,200,000	3,900,000	3
Bureau of Land Management	240,000	10,000	2
Montana State Forests	890,000	890,000	2
Private timberlands (property taxes)	--	640,000	20

Income From Private Timberlands[8]

In 1970, there were 2.2 million acres of private timberlands listed on the roles of county assessors, primarily in the eight western counties. The major owners at present are:

Firm	*Acreage*	*Comment*
Burlington Northern Railroad	About 850,000	Acquired through merger of the Northern Pacific and Great Northern Railroads
U. S. Plywood	About 670,000	Purchased from Anaconda in 1972
St. Regis Paper Company	More than 200,000	

These three firms alone account for about three-quarters of the private timberlands listed by county assessors.

The revenues collected as property taxes from private timberlands are dependent upon the acreages listed by assessors and by the assessed values of those lands. In the mid-1960's, acreages of lands classified as timberlands increased and their average assessed values decreased due to implementation of State law requiring reclassification of certain marginal lands from agriculture to timber (fig. 41). Since then, average assessed values have remained nearly constant.

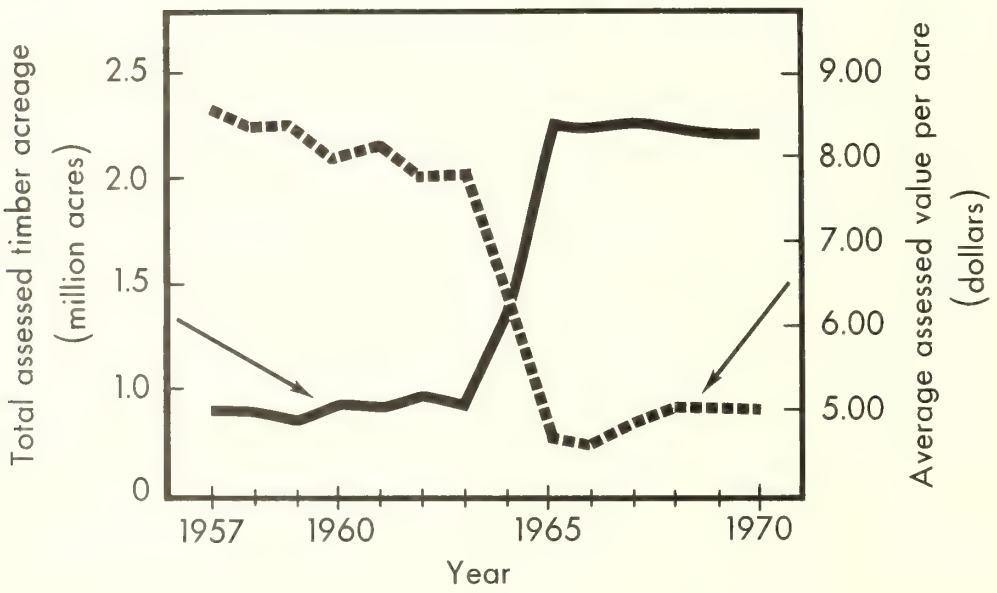

Figure 41.--Tax-assessed Montana timber acreages and average assessed values, 1957-1970.

[8]From Burr 1973, and Smith 1973.

One might speculate that large timberland holdings, on the average, will tend to be among the most valuable timberlands. As support of such a hypothesis, in 1970 county assessors valued 670,000 acres belonging to Anaconda in western Montana at an average of $0.97 more per acre than the mean assessments for all timberlands in the respective counties.

Five of the most heavily timbered counties have asked for higher timber valuation schedules for 1974. The Board of Equalization estimates that the taxable values of timberlands in Montana will be increased by about 30 percent.

Income From Indian Reservations

Most of the monies received from timber sales administered by the Bureau of Indian Affairs were passed on to the tribal councils. These funds included 90 percent of total receipts plus certain matching funds for forest improvement work. The distribution to individual Reservations in 1973 was:

Reservation	*Receipts (Dollars)*
Blackfeet	40,000
Crow	67,000
Flathead	3,742,000
Northern Cheyenne	45,000
Rocky Boy	9,000

Income From the Forest Service

The National Forests are the major source of timberland-based funds for local units of government. By law, the counties receive 25 percent of net monies received by the Forests, apportioned on the basis of the average of the Forest lands within the counties. These receipts have generally been increasing since World War II, but wide year-to-year fluctuations have primarily followed changes in timber markets. The National Forests making the largest payments, that lay primarily or wholly within Montana, were the Kootenai, Lolo, Flathead, and Bitterroot, all in western Montana.

From all the Forests of the Northern Region, headquartered in Missoula, South Dakota received $3,000, Washington received $500,000, and Idaho received $2,900,000. Montana's share was divided as follows:

County	*Share of 1972 National Forests receipts (Dollars)*
Lincoln	1,400,000
Flathead	800,000
Sanders	500,000
Missoula	300,000
Mineral	300,000
Powell	200,000
Ravalli	200,000
Granite	100,000
20 other counties	less than 100,000 each
Total	4,100,000

Much smaller payments are also made by the Federal Government under Public Law 874. This law provides that school districts enrolling children whose parents work on federally-owned land may apply for funds to be used for maintenance, operation, and construction. As in the case of the 25 percent funds, such payments are intended to compensate for facilities that are not locally taxable. We estimate that in 1972, as a result of Forest Service employment, school districts received about $500,000 under this law, primarily in western Montana.

All of the forest-managing agencies also contract for services and equipment. In 1972, the Forest Service spent about $4 million in Montana in this fashion.

A final category of expenditures that has economic consequences for Montanans is capital investments in the land to assure continued production of timber and other products. Under the Knutson-Vandenburg Act, a portion of the receipts from timber sales is retained by the Forest Service to assure that new stands are satisfactorily regenerated and managed. In 1972, about $4 millio was spent in the State for this purpose. For 1973, K-V funds amounted to 16.7 percent of all timber receipts in the Northern Region.

Because most timber stands are being harvested for the first time much of Montana's forests is unroaded. Consequently, the largest single capital investment is in road systems. Permanent roads are financed through reduced prices for timber stumpage to compensate timber purchasers for road construction and through appropriated funds. In fiscal year 1973, about $7.5 million of road construction was financed through stumpage sales (in addition to nearly $500,000 for temporary roads). Allowances for this road construction averaged about $18.50 per thousand board feet in western Montana and $16.70 per thousand board feet in eastern Montana. In addition, about $4.2 million of appropriated funds were used to construct roads, and another $4.6 million were used for engineering support of the development of purchaser-constructed roads.

Economic Implications of Changes in Timber Harvesting

Construction of new plants and the expansion of existing plants promise substantial increases in wood products production. Based on industry announcements, new primary employment in Montana over the next several years might include 200 jobs in lumber, 600 in plywood, particleboard and fiberboard, and 300 in pulp and paper production. If no jobs are lost elsewhere in the timber economy, this would represent an increase of more than 10 percent in direct timber-dependent employment.

Other projections generally agree that the wood products industry in Montana will grow. The relationships presented in figure 42 were derived from current official federal projections of economic activity (U.S. Water Resources Council 1972). Primarily because of an expected continuing decline in Montana's population over the next 30 years, total industrial earnings in the State are projected to increase much more slowly than for the Nation as a whole. But increases in the economic importance of the Montana wood products industries are expected to lead their U.S. counterparts and to become relatively more important to the State.

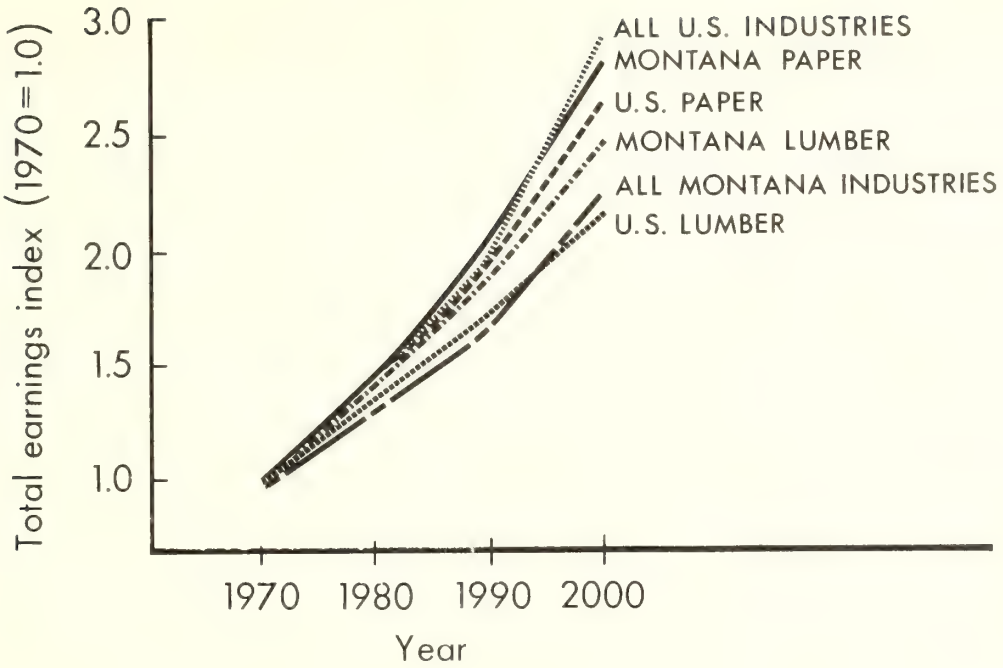

Figure 42.--Projected total earnings for selected Montana and U.S. industries, relative to total earnings in 1970. (Source: U.S. Water Resources Council. 1972. OBERS Projections: Regional economic activity in the U.S. (Series E Population), Vol. 4: States. 156 p., Washington, D.C.)

How realistic are such projections? No one knows for sure, simply because of the uncertainties encountered in looking ahead. These projections, for example, do not reflect current energy problems or recent trends in conservation and environmental concerns.

Many factors will determine the future level of wood products manufacturing. The factors are sometimes expressed through government action and sometimes through price changes in the marketplace:

1.--Federal laws or administrative fiats. The National Environmental Policy Act, for example, demands extensive public participation in agency decisionmaking and has a great potential for influencing the extent of both commodity and noncommodity production from the State's forest resources;

2.--State or local laws. State laws such as the Montana Environmental Policy Act can influence activities both in timber production and in wood processing;

3.--Social and economic forces. The proliferation of forest-oriented recreation and housing developments is constantly imposing new constraints on forest management activities:

4.--Changing prices. Prices for logs, lumber, and other wood products rise and fall as demand for new houses expands or contracts.

Any of these kinds of changes will bring a succession of repercussions. A new and restrictive interpretation of a law designed to protect wildlife, for example, might have an immediate impact on that forest resource, second-round impacts on the costs of forest management and the volumes of timber harvested, and third-round impacts on employment in the timber-processing industry. Insofar as we can predict these interactions, we can define the consequences to people.

We are not yet able to quantify social and cultural impacts except to the extent that they can be related to changes in personal income or employment. Similarly, a lack of empirical data severely restricts our ability to quantitatively evaluate environmental impacts. For example, we know that expanding timber harvesting into a new drainage will change the habitat for wildlife, increase the accessibility for vehicles, and lead to increased slash disposal and regeneration activities. There may be a net increase in production levels of local wood products plants, but we don't know yet whether there will be a net increase, decrease, or no change in environmental quality. This depends on developments in technology and processing and on a whole host of biological and social relationships that are not yet clearly defined.

A Case Study

For many years National Forests have been the principal contributors to Montana sawlog harvests. In 1972, these harvests amounted to about two-thirds of the State total. For this brief analysis we assume that Federal harvests will range from a 25 percent increase to a 20 percent decrease of that year's harvest as shown in table 10. For simplicity, harvests from all other lands are assumed to remain constant.[9]

Table 10.--*Hypothesized levels of timber harvesting in Montana*

Changes in harvest on National Forests (percent)	Volume change in harvest on National Forests	Actual harvest on National Forests	Harvest on other lands	Total Montana timber harvest	Changes in total Montana timber harvest
	Million board feet				*Percent*
25	188	938	450	1,388	16
10	75	825	450	1,275	6
0	0	750	450	1,200	0
-10	- 75	675	450	1,125	- 6
-20	-150	600	450	1,050	-13

[9]Under a constant market demand, private harvests would undoubtedly increase, at least in part to protect the new capital investments in plants mentioned in Chapter III.

Table 11.--*Distribution of the average dollars spent by logging and wood processing firms*

Selling firms	Purchasing firms: Logging	Purchasing firms: Wood processing
	Cents	*Cents*
1. Logging	11	14
2. Wood processing	0	3
3. Other manufacturing	2	1
4. Transportation	10	17
5. Communications and public utilities	1	3
6. Construction	0	3
7. Agriculture and mining	0	1
8. Trade	4	5
9. Services	2	3
10. Households	50	32
11. State and local government	1	6
12. Federal government	10	2
13. Out-of-State	9	10

From an economic study at Montana State University, we know that logging and wood processing firms spent money throughout Montana's economy.[10] Reading down the columns of table 11, for example, we see that logging firms (those firms primarily engaged in logging, either independently or as contractees of wood processing firms) spent $0.10 of each purchasing dollar for services from transportation firms (line 4). Subcontracting and log transfers account for most of the $0.11 that logging firms on the average spend to purchase inputs from other logging firms. Labor, management, and owners, collectively called households, receive $0.50 out of the average dollar expenditure, but only $0.32 of each dollar spent by wood processing firms; logging firms are more labor-intensive. Payments to governments, principally for public stumpage and taxes, are shown in lines 11 and 12. Zero entries in the table reflect very small or no purchases.

When the numbers of dollars spent by logging and wood processing firms were matched to the assumed changes in timber harvesting (summarized in table 10), we found that a 10 percent change in harvesting on the National Forests would affect about 900 jobs statewide in the firms either directly or indirectly dependent upon timber (table 12).

Substantial magnitudes of economic impacts are associated with changes in harvest levels. Johnson (1972) estimated the impacts would be even larger than those shown above. For our lowest harvest level, the 20 percent Federal

[10]Details of the economic input-output analysis used in this section are available from R. J. McConnen, Department of Economics and Agricultural Economics, Montana State University, Bozeman.

Table 12.--*Impacts of selected changes in timber harvesting levels*

Assumed changes		Impacts	
Change in harvest on National Forests	Change in total Montana harvest	Change in Montana personal income	Change in Montana employment
Percent		*Dollars*	*Man-years*
25	16	19,400,000	2,400
10	6	7,800,000	900
-10	- 6	- 7,800,000	- 900
-20	-13	-15,400,000	-1,900

and 12.5 percent statewide reductions, which are equivalent to a decrease of 150 million board feet, Johnson estimated a decline in personal income of $22 million and a decline in employment of 2,370 man-years; these estimates are 43 and 27 percent greater than ours, respectively. The net effect of the shortcomings that may exist in our analysis, then, would seem to be conservative

Our rough estimates of impacts ignore the question of just where jobs and incomes might change. An increase in harvesting would lead to few new jobs in a town that has an unused capacity in supermarkets and other derivative industries. Lack of skilled labor locally may lead to the hiring of non-Montana residents to fill the higher paying new jobs, and local residents will not benefit, at least in the short run (Schaill and Power 1973; Smith and others 1971). The consequences of an increase in harvesting will generally not be the mirror image of the consequences of a decrease, except in a very crude sense. And, finally, we have not spoken at all about nonjob, nondollar consequences.

A Broad Economic Perspective on Timber Production

The human consequences within Montana of economic changes related to the timber harvest will depend as much on the availability of economic alternatives as on the magnitude of the changes themselves. The economic alternatives that may exist in other geographic locations and the general level of economic activity within Montana deserve consideration.

GENERAL ECONOMIC CONDITIONS

The relative attractiveness of alternatives in other geographic locations is the main factor that accounts for migration. Although fairly stable in total numbers, Montana's population has been made up of very mobile individuals. For example, between 1965 and 1970, more than one-third of the population made a major geographic relocation. Therefore, if jobs in an area decreased by, say 1,000, it did not necessarily follow that 1,000 people were without jobs in

that area. Most of the people without jobs might have moved to another area. If economic conditions nationwide are bad and national unemployment is high, the local consequences of a reduction in timber harvesting will be different than if those economic conditions are good.

The general level of economic activity within the State is also important. In 1973, preliminary estimates suggest cash receipts to agriculture increased by as much as $200 million over the cash receipts for 1972. A decrease in timber harvest of 150 million board feet during a year in which cash receipts to agriculture increased by $200 million would hardly be noticed at the State level. There would, of course, be serious local impacts, but even they would be muted. On the other hand, if a decrease in timber harvesting coincides with a decrease in cash receipts to Montana agriculture, the combination of economic consequences would be severe.

The economic impact of changes in other, nontimber-related activities cannot be precisely determined at this time. But we do need to keep in mind that any adverse economic impact of a reduction in timber production might be offset by economic activity elsewhere. That is, the State's reduced ability to manufacture and export timber products might be compensated for by a simultaneous (but not necessarily related) increase in recreation or strip mining. Although forest-oriented recreation does not appear to be particularly promising as a source of new income and employment (Johnson 1968; Beardsley 1971), any increase could be of immense local value. More importantly, at the State level, new jobs related to increased strip mining for coal could far overshadow any foreseeable change in timber-based employment. Nevertheless, the timber industry is of substantial importance to the economic health of local communities and to all of Montana. But the state of the industry is beyond local control.

The wood products industry in Montana is primarily dependent upon an export market--we estimate more than 90 percent of Montana lumber is shipped out of State. All of the pulp and paper, and most of the plywood and particleboard, are also exported from the State. A larger proportion of roundwood products--posts, poles, houselogs--are used within the State but they make up a relatively minor part of the wood products industry.

DEPENDENCE ON NATIONAL MARKETS

Montana's wood product market is essentially the national market for softwood building materials. Some factors of interregional competition among different softwood-producing areas (such as species differences, transportation costs, availability of rail cars, local weather conditions) may from time to time affect Montana's sales of wood products; but by far the biggest influence on the market is general national economic conditions and particularly the activity in the construction industry.

If housing construction declines, the market for wood products shrinks, and the wood products industry in Montana suffers a severe economic blow. A national shortage of money for home mortgages leads to an economic contraction in Montana's wood products industry. Unemployment increases in the woods, in the wood products plants, and in the many businesses in Montana that are dependent

on the wood products industry. Payrolls and tax receipts decrease. From Montana's point of view, any national failure of the construction industry is extremely painful.

The industry cannot be vigorous without a strong national demand for wood products. If that demand exists, the economic well-being of a substantial number of Montanans will depend on the supply of wood fiber to meet that demand.

MAINTAINING TIMBER SUPPLIES

In Montana, the available supply of wood can be increased as follows: (1) the harvesting of timber on land not reserved from harvesting can be increased; (2) through more intensive management, the production of timber per unit area can be increased; and (3) a higher proportion of timber grown can be converted into wood products.

The forests of Montana are primarily old-growth timber. Any increase in harvesting in the near future will require increased investment dollars to meet several basic management needs.

The first need is to insure that all other values of the forest are adequately protected and, hopefully, improved. On Federal lands such assurance is provided through the land use planning process, which fulfills the requirements of the National Environmental Policy Act (and there are parallel mechanisms applicable to other public and to private lands). This planning process, which includes the gathering of public comments and the preparation of Environmental Impact Statements, is expensive and time consuming. The same is true of all other aspects of planning, down to the actual timber sale layout, which in recent years has been done with a growing awareness of the effect any manipulation of one resource has on the other resources.

The second need is to provide physical access to timber that is harvestable. The rate at which adequate transportation systems are developed in previously unroaded areas, which is dependent both upon the rate of completion of the planning process and the availability of appropriated funds, sets an upper limit on how fast timber can be harvested. How much timber can be cut, especially on special and marginal areas, then will be at least partly dependent upon the logging systems that are available.

Finally, it is necessary to assure there will be a continuing supply of timber produced for future harvesting. The old growth was a gift of nature which, for the most part, has received little more than a custodial level of protection. But the responsibility has been accepted to assist nature in the future, to ensure the forests are not exploited without replacement. This implies both that newly cut areas and "back-log" acres must be adequately regenerated.

Earlier we discussed a variety of ways in which intensive management can increase timber production, starting with stocking control and including genetics. By concentrating only on the most productive half of the timberlands in Montana, we estimate that the State's average timber growth could be doubled. On the Federal lands, which provide the bulk of Montana's timber, such activities initially are not self-financing but are dependent on congressional funding.

The first requirement for utilizing presently unused wood fiber is that a market exists. The activities of the Montana wood products industry suggests markets are developing. Witness:

--the 1974 opening of a fiberboard plant and the planning for a new particleboard plant,
--the planned substantial expansion of the pulp- and papermill,
--the steadily increasing purchases of Montana mill residues and dead roundwood by west coast pulp- and papermills,
--the increasingly common utilization for lumber production of materials that a few years ago were too small.

In response to growing market opportunities for wood products, there has been an increasing effort to develop methods for better utilizing the wood resource, both in harvesting and processing. Improvements in sawmill technology during the past decade have permitted high-speed, economical sawmilling of small logs, and have reduced waste through narrower saw kerfs, and chipping headrigs convert slabs and edgings into pulp chips. Some of the newest small log mills can manufacture lumber from logs down to 2.5-inch diameter.

Skyline yarding of logs by systems of elevated cables is not yet widespread in Montana, but each year more and more harvesting is being done with this equipment. This permits logging in areas too steep or too fragile for ground skidding and has enhanced the opportunities to log in partially cut stands. Some work has also been done in field-chipping of forest residues to improve the recovery of available fiber.

In most mature stands in Montana 25 to 50 percent or more wood fiber--tops, branches, cull material--remains after logging. It may not be economically feasible to capture all this fiber in the immediate future, but current trends in utilization and research work now underway show promise for making much of this fiber technologically available. This is a direct and potentially low-cost source of new supply (Vaux 1973).

Insofar as the wood products industry is able to develop and maintain efficient national marketing channels and production processes that meet prevailing esthetic and ecological constraints, industrial demands for these fiber materials will undoubtedly grow.

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Headquarters for the Intermountain Forest and Range Experiment Station are in Ogden, Utah. Field Research Work Units are maintained in:

Boise, Idaho
Bozeman, Montana (in cooperation with Montana State University)
Logan, Utah (in cooperation with Utah State University)
Missoula, Montana (in cooperation with University of Montana)
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SCHWEITZER, DENNIS L., ROBERT E. BENSON, AND RICHARD J. McCONNEN.
1975. A descriptive analysis of Montana's forest resources. USDA For. Serv. Resour. Bull. INT-11, 100 p. (Intermountain Forest and Range Experiment Station, Ogden, Utah 84401.)

One-fourth of Montana is forested. The forest's wildlife, recreational opportunities, forage, water, minerals, and timber are important to the economy and environmental quality of the State. Although some problems exist, progress has been made in reducing the conflicts among these uses and in reducing threats to air and water quality.

OXFORD: 644.5; 905.2.
KEYWORDS: Use (forest land); resources, forage, timber, minerals, water, recreation, wildlife, environmental quality, forest economics.

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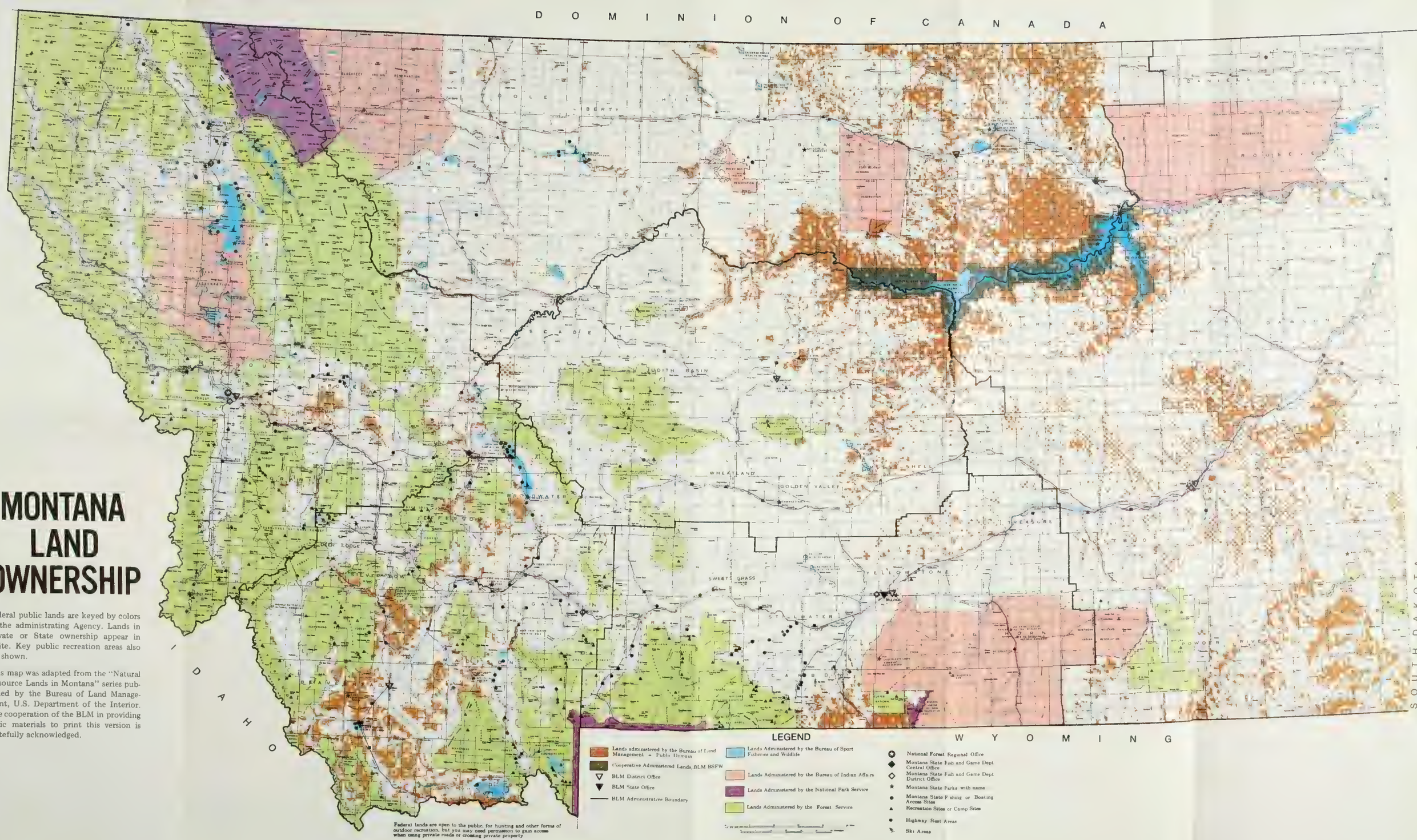
MONTANA LAND OWNERSHIP

Federal public lands are keyed by colors to the administrating Agency. Lands in private or State ownership appear in white. Key public recreation areas also are shown.

This map was adapted from the "Natural Resource Lands in Montana" series published by the Bureau of Land Management, U.S. Department of the Interior. The cooperation of the BLM in providing basic materials to print this version is gratefully acknowledged.


DOMINION OF CANADA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
IDAHO
LEGEND
Lands administered by the Bureau of Land Management = Public Domain
Cooperative Administered Lands, BLM BSFW
BLM District Office
BLM State Office
BLM Administrative Boundary
Lands Administered by the Bureau of Sport Fisheries and Wildlife
Lands Administered by the Bureau of Indian Affairs
Lands Administered by the National Park Service
Lands Administered by the Forest Service
National Forest Regional Office
Montana State Fish and Game Dept Central Office
Montana State Fish and Game Dept District Office
Montana State Parks with name
Montana State Fishing or Boating Access Sites
Recreation Sites or Camp Sites
Highway Rest Areas
Ski Areas
Federal lands are open to the public for hunting and other forms of outdoor recreation, but you may need permission to gain access when using private roads or crossing private property

TIMBER RESOURCES OF WESTERN SOUTH DAKOTA

Alan W. Green

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INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Forest Service
U.S. Department of Agriculture
Ogden, Utah 84401

RESEARCH SUMMARY

Reports findings of the comprehensive survey of western South Dakota's 1.4 million acres of forests, which include 1.2 million acres of commercial forest land. Presents statistics on area, volume, growth, mortality, and timber use. Also describes species, volumes per acre, stocking, site quality, ownership, trends in product harvesting and other factors that bear on timber management. Opportunities and problems related to future development are discussed.

THE AUTHOR

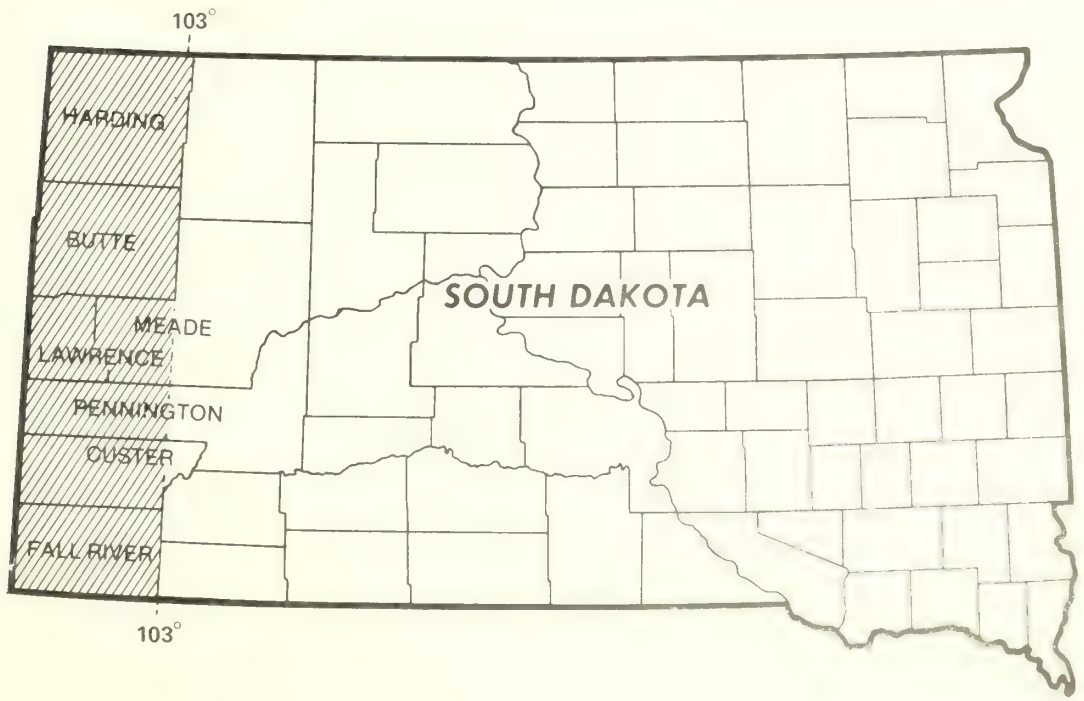
ALAN W. GREEN is Acting Project Leader of Renewable Resources Evaluation at Intermountain Station. His career has included research in silviculture and regeneration, economics of timber production, and foreign forestry resources. In addition to a degree in economics, he holds both bachelor and master of science degrees in forestry from Purdue University.

FOREWORD

This report presents basic statistics on western South Dakota forest area, timber volume, growth, mortality, and removals. It also discusses the outlook for future timber supplies from State and privately owned forest land.

The area covered in this report includes all of Harding, Butte, Lawrence, and Fall River Counties, as well as all lands west of the 103rd Meridian in Meade, Pennington, and Custer Counties. Timber statistics for South Dakota reported by Choate and Spencer (5) were for the entire State and so cannot be compared directly with data reported here.

Data are from timber inventories conducted from 1971 to 1974 by the South Dakota State Department of Game, Fish, and Parks, Division of Forestry; and the Rocky Mountain Region, Forest Service, in cooperation with the Intermountain Forest and Range Experiment Station, Forest Service, Ogden, Utah.



A 2-MINUTE SUMMARY

- There are 1,246,800 acres of commercial forest land in western South Dakota; 63,200 acres less than in 1970 (7).
- Most of it is in public ownership, but farmers hold over 154,000 acres, 70,000 acres less than in 1960.
- Land productivity is relatively low, but climate and soils make good tree growth possible. Average annual net growth is 32 ft^3 per acre per year.
- There are 1.6 billion ft^3 of wood, 5.6 billion bd.ft. (International 1/4-inch rule) of sawtimber. Pennington, Lawrence, and Custer Counties have the most timber.
- Mortality is low, but increasing due to greater insect activity.
- Because of prolific regeneration and resultant dense stands, an intensive thinning program is required to keep stands in a productive condition.
- State and private lands have the potential to produce in excess of 12 million ft^3 per year. Only about 192,000 acres are presently operable, with a potential output of 8.5 million ft^3 per year.
- Planned output for State and private lands is about 6.2 million ft^3 per year from the operable area. In order to assure wildlife, grazing, recreation, and esthetic goals are achieved, managed stands will have fewer trees than would be required to maximize timber output.
- Removals from National Forest and private ownership have increased since 1970.
- Maintaining markets for small size material and management money are key items for achieving planned goals and objectives for western South Dakota's forest resources.

SIGNIFICANT CHANGES

- The area of commercial forest land is 63,200 acres less than reported in 1970 (7).
- Commercial forest land owned by farmers is 70,000 acres less than in 1960 (4).
- Growing stock volume and sawtimber volume increased 6 million ft^3 and 2.2 billion bd.ft., respectively, since 1960 (4).

Sampling techniques, revised land classification, and changes in land status account for much of the reduction in area. The loss of farmer-owned CFL is due, in large part, to withdrawals for nontimber uses.

The increases in volume are due, in part, to growth rates in excess of removals over the period and, in part, to changes in sampling techniques used in more recent inventories.

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A BRIEF HISTORICAL FLASHBACK

Any discussion of western South Dakota forests is primarily one of the Black Hills. This 4,500 square mile uplifted granite, limestone, and metamorphic rock island in the Great Plains is a major geographic landmark of the United States, attracting hundreds of thousands of visitors each year (12). These visitors are more likely to look at the Black Hills as a suitable setting for Gutzon Borglum's transformation of Mt. Rushmore than an important source of timber. But although the area is heavily used for recreation, significant values are derived from the water, wildlife, livestock grazing, and timber associated with the forest.

The values of the timber and related resources of the Black Hills have been recognized for more than a century. Before 1870, these were the hunting grounds for Plains Indians. The ponderosa pine forests were subject only to the vagaries of nature and to fires set by the Indians to drive game. As a consequence, the stands of timber were generally sparse or open (10).

With the discovery of gold and the subsequent opening of the area to white settlement came significant changes in the use and nature of the forest. The timber resources were exploited for mining and the attendant construction of houses and other buildings, and later to supply timber needs for construction of railroads (3,10). Fires continued to go unchecked. Concern for what was happening to the resources of the Black Hills led to much of the area being set aside as a forest reserve in 1897. That reserve later became the Black Hills National Forest.

The increased density and vigor of the timber, consequences of protection and management of the forest since the turn of the century, are clearly seen in the remarkable comparative photographs taken from the same locations in 1874 and 1973.[1]

---

[1]Photographs courtesy of Agricultural Experiment Station, South Dakota State University, Brookings, South Dakota.

The 1874 photographs were taken by William H. Illingsworth during a 60-day expedition into the Black Hills to gather extensive information about the terrain and resources. The expedition of some 1,200 troopers of the 7th Cavalry and assigned civilians was under the command of Lt. Col. George A. Custer, elevated to the rank of Brevet Major General for the occasion (10). Custer and his command left Fort Lincoln for the northwestern edge of the Black Hills July 2, 1874. Two years later (June 26, 1876), he was to die in the battle of the Little Bighorn.

The "today" pictures were taken by Richard H. Sowell, South Dakota State University, for Dr. Donald R. Progulske during a study to show man's impact on the environment and resources of the Black Hills. The Progulske publication (10) is a delightful and most informative look at the history and development of the Black Hills.

General Custer's 1874 encampment near Dearfield, looking up Silver Creek, near the confluence of Castle Creek....

...and in 1973 (above). (Below) another 1874 view of the same encampment area...

...and in 1973.

TODAY'S FOREST

The Size of It

About 20 percent of the land area is forest...

and 91 percent of the forest is classed commercial.

There are nearly 1.4 million acres of forest land in western South Dakota. Over 1.2 million acres are classed as commercial forest land (CFL), suitable and available for timber-growing activities. About 11,000 acres of productive forest land are reserved from cutting because of uses that preclude timber harvesting. Most of this land is in Mt. Rushmore National Memorial, Wind Cave National Park, and Jewel Cave National Monument.

Land Class	*Area* (Thousand acres)
Commercial timberland	1,246.8
All other forest land:	
Productive reserved	11.1
Other reserved	1.3
Other forest nonreserved	108.1
Total forest land	1,367.3
Nonforest land	5,511.5
Total land area	6,878.8

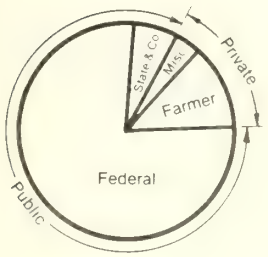
Most of the noncommercial forest land is relatively unproductive; either the site conditions are unfavorable for economic production of useful wood, or the sites are occupied by kinds of trees not commercially useful.

Who Owns It

Over 80 percent of the commercial forest land is publicly owned or administered:

The bulk of the CFL is publicly owned.

Owner Group	*Area* (Thousand acres)	*Percent of Total*
Public:		
Federal	961.0	77.1
State	67.0	5.4
County and municipal	3.4	0.2
Subtotal	1,031.4	82.7
Private:		
Forest industry[2]	--	--
Farmer	154.6	12.4
Misc. private	60.8	4.9
	215.4	17.3
Total	1,246.8	100.0



The Forest Service has the most CFL.

The principal owner is the Forest Service. Its 952.5 thousand acres represent 76 percent of the total and 83 percent of the publicly owned commercial forest land. The biggest part of its holdings are the Black Hills National Forest in Pennington, Custer, Meade, and Lawrence Counties with minor areas in Fall River County, and small areas of the Custer National Forest in Harding County.

[2]Forest industry data have been combined with miscellaneous private data to avoid disclosure of an individual owner.

The Bureau of Land Management administers most of the other federally owned commercial forest land.

Other publicly owned land belongs to the State, administered and managed through the State Department of Game, Fish, and Parks, Division of Forestry. Its biggest single holding is Custer State Park.

Collectively, private individuals own more CFL than any owner except the Forest Service.

Privately owned commercial forest land is dominated by small private owners, largely farmers, who collectively control 154,000 acres, or 12 percent of the total and 72 percent of all privately owned commercial forest land. This is 70,000 acres less than reported for 1960 (4). These holdings are rather evenly distributed throughout the seven counties.

How Productive Is It

Some poor soils and exposed bedrock reduce the average productivity of the land.

Compared to other important timber producing areas in the West, the commercial forest land in western South Dakota is not highly productive. Only about 3 percent of the land is capable of growing as much as 60 ft^3 of wood per acre per year.

Shallow soils with low moisture-holding capacity are common. Also, there are many areas where exposed bedrock prevents the establishment of trees. In such areas, stands tend to be sparse-to-open, and over a given time period cannot produce the amount of wood possible with more dense stands.

But the land is well suited for growing crops of timber.

But although the productive capacity of the CFL is limited, the area is well suited to timber culture. As Boldt and Van Deusen (3) point out, "This basic premise is neither speculative or theoretical--its validity has been demonstrated by actual forest responses to nearly a century of consumptive use."

Timber Kinds and Sizes

Ninety-four percent of the CFL is growing ponderosa pine.

Were it not for some 24,000 acres of spruce type (mostly in Lawrence, Pennington, and Custer Counties), the softwood (evergreen) forest would appear to be a single species, ponderosa pine (*Pinus ponderosa*). As a forest type, it occupies nearly 1.2 million acres of the CFL.

Hardwoods are not a significant resource for timber purposes.

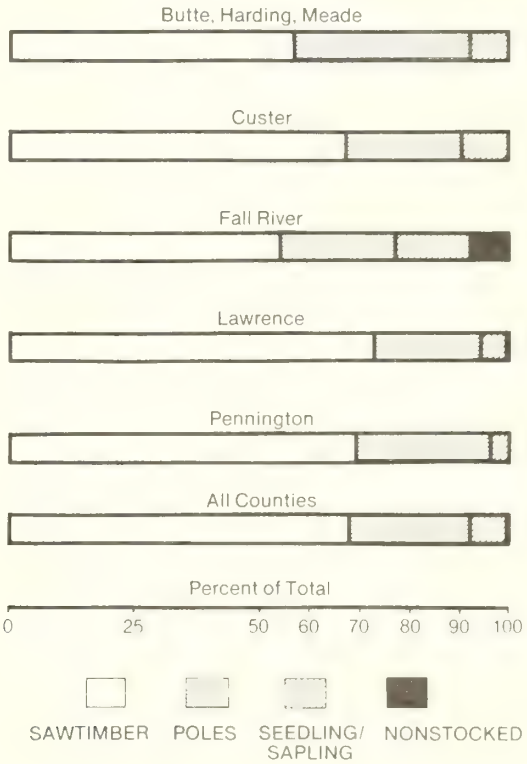
Hardwoods (broadleaf species) cover only about 50,000 acres and include localized pockets or small stands of aspen (*Populus tremuloides*), as well as a mixture of oak and other species in the hills, and considerable cottonwood (*Populus deltoides*) along major streams and rivers.

Two-thirds of the CFL area is occupied by sawtimber stands.

Sawtimber stands dominate the commercial forest land in all counties. Although Custer, Lawrence, and Pennington Counties have the most sawtimber stand area, Lawrence County has the highest proportion of sawtimber and none of the counties has less than 50 percent of the CFL in that size class.

This does not mean there are no small trees in these stands. Stand-size classification can be misleading in terms of the diameter distribution simply because of the way stand sizes are defined[3].

Percent of commercial forest land by stand-size class.



[3]Softwood sawtimber trees need be only 9.0 inches d.b.h. (hardwoods, 11.0 inches); sawtimber stands need have only half the total stocking in sawtimber and poletimber trees, with sawtimber at least equal to pole timber stocking.

Only 8,700 acres are classed as nonstocked.

There is little nonstocked area and most of it is in Fall River County. This attests to the ease with which natural regeneration becomes established following harvesting activities.

How Is It Used

Visitors won't find grizzly bears or wolves...

The grizzly and the grey wolf are gone and the black bear and mountain lion are rarely seen. But, there is abundant wildlife to be seen by the hundreds of thousands of people who annually visit the Black Hills.

but they may see some 60 varieties of other animals, as well as birds and fish.

Deer, elk, wild turkey, antelope, beaver, buffalo, and even Rocky Mountain goats and Big Horn sheep can be found. Many of these animals and birds have been introduced or reestablished over the past 50 years or so (12). In the streams and lakes, fishermen find several varieties of trout, most of which have been introduced and maintained by the State.

Outdoor recreation is the dominant use of much of the forest today. Management of the forest is designed to integrate recreation opportunities, esthetics, protection of wildlife habitat, and production of usable wood. Tree harvesting is a necessary part of maintaining wildlife habitat and a varied landscape, as well as a healthy forest.

Major nontimber uses of the forest include outdoor recreation.

The diverse recreation opportunities of the Black Hills National Forest are used at the rate of about *2 million* visitor-days annually. Much of the recreational activity is in developed sites for camping, picnicking, and boating. However, about 70 percent of the present use is for dispersed activities such as hiking, hunting, and sightseeing, the most common activity (12).

Livestock grazing, though sometimes a controversial issue, is a controlled use on the Black Hills National Forest during the summer. In 1975, 26,900 cattle and horses and 4,700 sheep grazed over 125,000 animal unit months on the National Forest (12).

THE TIMBER RESOURCE

How Much Wood

Although only about 1.6 percent of the total wood volume in the Rocky Mountain States is in western South Dakota, it is an important resource.

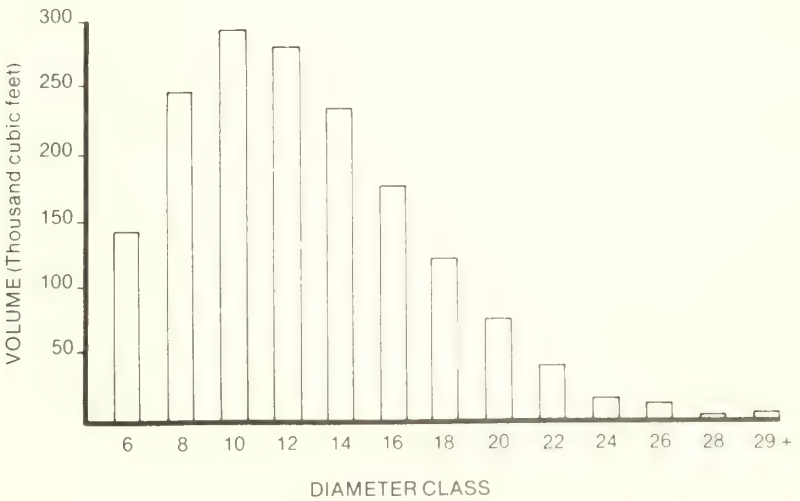
In 1974, CFL in western South Dakota contained an estimated volume of 1.7 billion ft^3, 1.6 billion of it in growing stock trees, most of it softwood timber. About 1.25 billion ft^3 are in sawtimber size trees (9.0 inches d.b.h. and larger for softwoods and 11.0 inches for hardwoods), estimated at 5.6 billion bd.ft. (International 1/4-inch rule), 2.2 billion bd.ft. more than in 1960 (4).

Custer, Lawrence, and Pennington Counties are the most heavily timbered.

The bulk of the standing volume is in Custer, Lawrence, and Pennington Counties, the latter having the most, 589 million ft^3. Lawrence County accounts for about half the hardwood volume (8.6 million ft^3). Nearly 73 percent of the cubic foot volume is in trees less than 15 inches d.b.h.

Nearly three-fourths the volume is in trees less than 15 inches d.b.h.

Volume by diameter class



Growth — Mortality

Net annual growth is higher than the average of the Rocky Mountain States.

In spite of the low productivity of the forest land, relative to the rest of the Nation, growth of timber in western South Dakota is above average for the Rocky Mountain States. Gross annual growth is about 43.7 million ft^3 or 35 ft^3 per acre. That is about the average for the other States. However, a low estimated mortality rate (3 ft^3 per acre compared to 11 ft^3 for all the Rocky Mountain States and about 9 ft^3 for the Nation), results in a net annual growth of growing stock of 32 ft^3 per acre, 8 ft^3 more than the average.

Ninety percent of the growth occurs on 90 percent of the CFL...

About 90 percent of the net annual growth is in Custer, Lawrence, and Pennington Counties, about the same proportion as CFL area, but that does not mean all the counties are equally productive:

but growth rates vary by county.

County	*Average net annual growth (ft^3/A/yr)*
Butte, Harding, Meade	32
Custer	28
Fall River	21
Lawrence	36
Pennington	34
All counties	32

Insect activity is increasing in some areas...

and mortality may be underestimated in terms of current conditions.

Recent increases in mountain pine beetle activity indicate that current tree mortality is probably somewhat higher than that found during the last inventory. Hardest hit seems to be Lawrence County, but no current accurate estimate of the amount of damage is available. There is a real need for damage survey in areas of most severe infestations.

Western red rot and other fungi have caused substantial volume losses in older stands (8). But, the continuing conversion of older stands to faster growing young stands will significantly reduce the impact of these diseases as well as that of insects (3).

It should be noted also that in contrast to ponderosa pine areas in other parts of the West, the Black Hills ponderosa pine is free of dwarf mistletoe (1, 3).

Snowbend and windthrow losses vary from year to year, but currently are the third ranked cause of mortality. Snowbend and breakage occur more often in sapling and small pole-size stands; windthrow is a more common hazard to large pole and small sawtimber sizes (3).

Removals

A record high volume of 17.9 million ft^3 was cut in 1974...

In 1974, 17.9 million ft^3 of roundwood products were harvested (11), two-thirds of which were saw logs, amounting to 76.7 million bd.ft. (International 1/4-inch rule). The remainder, about 6 million ft^3 were pulpwood, poles, posts, and fuelwood.

but, 700,000 ft^3 were left as logging residues.

Removals from growing stock were 17.7 million ft^3 (or 44 percent of net growth) and about 0.114 million ft^3 came from dead trees. The latter represents only about 0.2 percent of the salvable dead volume and 9 percent of the annual estimated mortality.

Seventy-five percent came from National Forests, the rest from private land.

Three-fourths of the total output came from National Forest and almost all the rest from private land. More than half the total came from Lawrence County.

Output from all lands is expected to increase.

The estimated output for 1977 (appendix tables 10 and 11) is about 19.7 million ft^3 if present trends continue. That would represent an increase of 31 percent over 1970.

Sawtimber removals are expected to total 82 million bd.ft. for saw logs and account for about the same proportion as in 1974. "Other removals" associated mainly with land withdrawn from timber use, are expected to account for about 1 percent.

PROSPECTS FOR FUTURE WOOD SUPPLIES FROM STATE AND PRIVATE LAND

The future timber supplies from western South Dakota will be influenced by (a) the management goals of the owners or managers of the resource; (b) the potential of the land to grow wood; (c) the condition of the existing resource; and (d) the amount of money available for silvicultural treatment.

The major supplier will, of course, be the Black Hills National Forest. The planned cut through 1986 is in excess of 36 million ft^3 per year (5). *Because the bulk of the remaining CFL is in State and private ownership, the remainder of the report will examine the timber resource on those lands, an area of about 242,000 acres, excluding Custer State Park.*[4]

Potential Versus Available Output

State and private CFL has the potential for producing about 12.4 million ft^3 of wood annually.

Potential output of timber is a function of land productivity and the level of management or silvicultural practices applied to the timber resource (5). Given current and prospective future on-site costs for silvicultural treatments, State and private lands have the capacity of producing 12.4 million ft^3 per year under a management program of a precommercial thinning at 10 years, commercial thinnings every 20 years, and a final harvest at the end of a 110-year period. Stand density would have to be maintained between 120 and 140 ft^2 of basal area per acre.

Even if achieving the potential were considered desirable, that level of output would be impossible to reach at present...

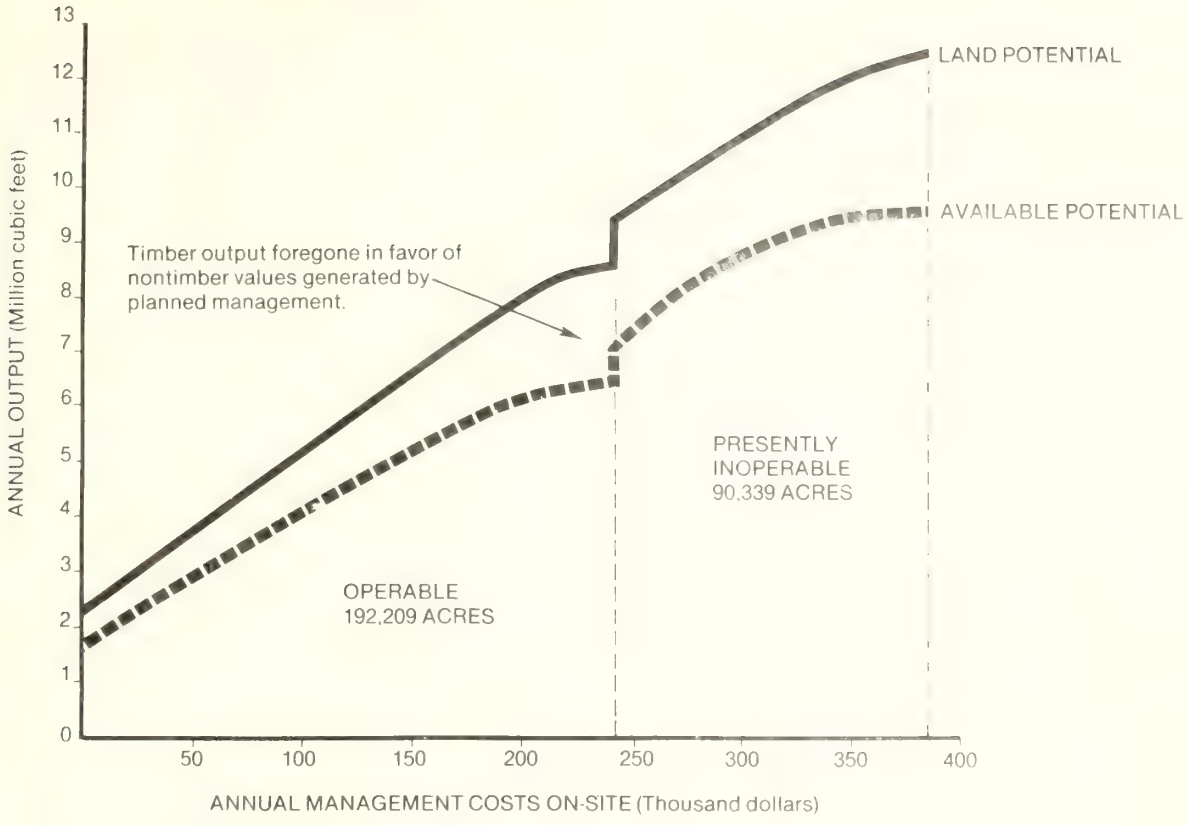
That output could be reached only if *(a) the entire CFL area were operable; (b) the forest resource were managed strictly for timber production; (c) the forest were fully regulated, and (d) sufficient funds were available for on-site cultural activities when needed.*

because not all the land is operable...

The fact is, however, nearly 20 percent of the CFL is now considered "*inoperable*." Along with a prudent logging operation that would protect the soil and other associated resources, steep slopes and other conditions make harvesting and management impossible or unwise with present harvesting techniques.

---

[4]Custer State Park is excluded from much, but not all, of the more detailed examination of the resource that follows. Although timber will be harvested from the Park, such removals will be requirements to enhance the other values and meet the overall management goals of the Park, rather than representing any specific timber production goal.



Potential output and available output, State and privately owned CFL, western South Dakota.

and more management money is needed.

There are over 30,000 acres of dense young stands needing thinning. The State has placed these lands in the inoperable category because present and prospective future (short term) management money available is insufficient to realistically include them in its management plans. (The Black Hills National Forest has a similar situation; such lands are included in the Marginal land component).

To grow the potential of the operable area would cost about $245,000 a year.

At current costs, potential output on the operable area is estimated at 8.5 million ft^3, and would cost $245,000 annually for on-site management activities. For the 192,000 operable acres, this would amount to about $1.28 per acre per year.

Managing the currently inoperable area will cost more.

Should the entire 90,000 acres of inoperable area become available for harvest and management, an additional 3.9 million ft^3 of wood could be produced annually at an estimated additional cost of $140,000 or $1.55 per acre per year. The likelihood of this happening is small, however.

Management plans propose levels of output less than the land's potential...

The State Division of Forestry has timber management plans for each county. Because its forestry program includes technical and financial assistance to private owners and coordinated programs with other public agencies, these plans include a proposed target timber harvest for all

non-Forest Service lands. The timber management objectives outlined in these plans are much the same as the Forest Service's multiple use goals. Timber is considered to be an important available commodity to be grown and utilized along with other commodity and noncommodity goods and services. Therefore, there is no intention to assume a management posture to maximize timber output on State-owned land or to recommend such a program to private owners.

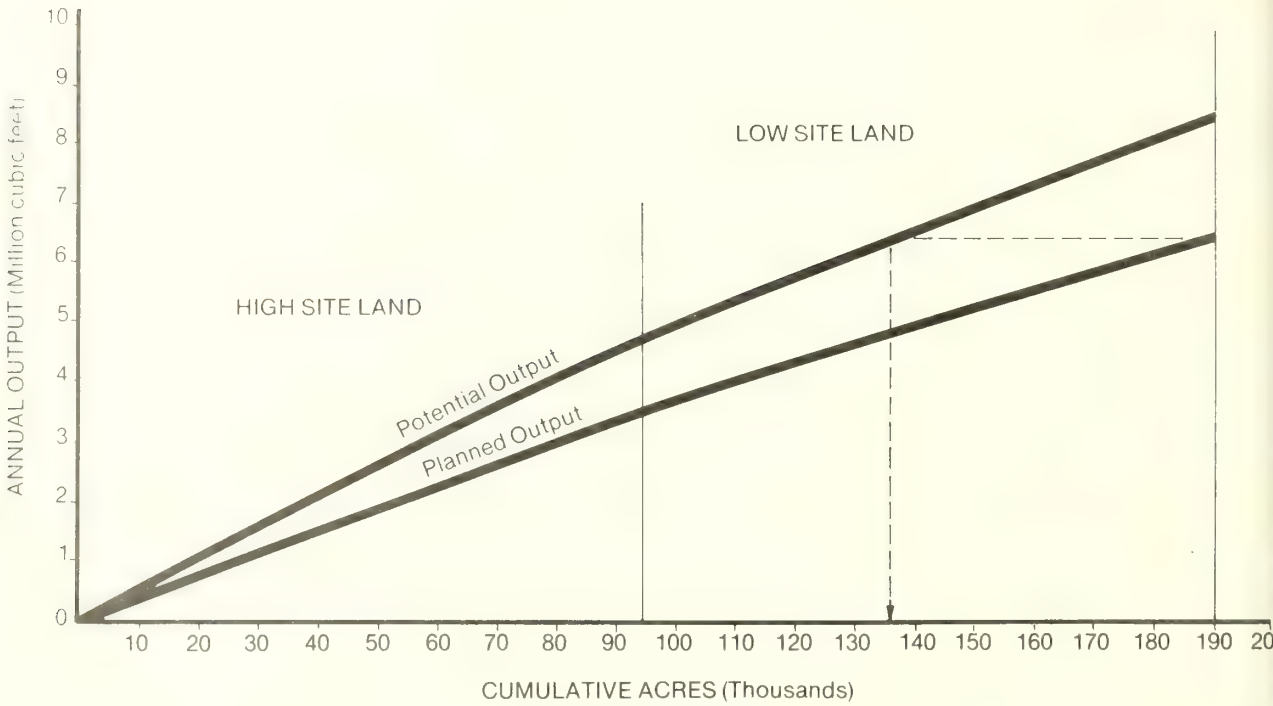
to favor other forest resources and values.

Maximizing timber output would require stand densities nearly twice those planned. Only with a more open forest can the nontimber objectives for livestock range, wildlife habitat, water production, esthetics, and other recreational uses of the forest land be achieved.

Planned output could be achieved by intensively managing fewer acres...

Available Output -- The difference between potential and available output (planned for period following achievement of full regulation) indicates the trade-off between timber and the nontimber values achieved.

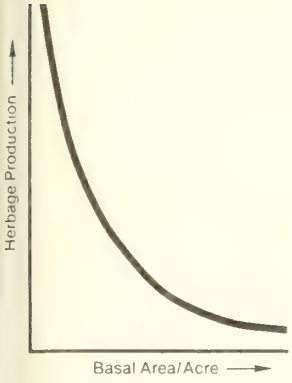
Because of uncertainty as to whether private owners will in fact act in accordance with plans, the "available output" has to be considered as the probable upper limit.



Potential and planned output for operable area, State and private lands.

but the overall management objectives would not be met.

Looking again at the potential and planned output, by intensively managing all the high-site land now operable and an additional 42,000 acres of low-site land, the total planned output could be achieved. In other words, only 136,000 acres would need to be intensively managed rather than 192,000 to get the same annual output. This would result in a savings of about $66,000 annually. But, in terms of overall management objectives, that would be a false saving.



The 56,000 acres of unmanaged land would not provide the water, wildlife, range and esthetic value objectives; nor would the intensively managed areas. Why? Because maximizing timber output on the 136,000 managed acres would require stand densities so high that good wildlife browse and herbage production would not be possible. The unmanaged areas would soon grow into such densities that they would provide about the same nontimber values as the high density, managed stands and little timber. They would also look worse.

To achieve the planned potential output of timber and nontimber values, the manager must begin with existing timber and nontimber resources.

Achieving the available potential timber output is not just a matter of scheduling intermediate cuts and harvesting. There are specific conditions that exist now, with respect to timber stands and to the forest in general, that need to be examined. The manager must begin with the current timber resource and manipulate it during the next few decades in a manner that will result in a timber resource of a kind and condition that will allow both future timber and nontimber goals and objectives to be met.

The Existing Timber Resource

Softwood timber stands are relatively young...

Stand Age and Size -- Although there are some stands as old as 240 years, the bulk of CFL is occupied by stands in the 50- to 130-year class, with heaviest concentration in the 50- to 100-year-old class.

Nearly 60 percent of the CFL is occupied by sawtimber stands:

but over half are sawtimber size.

Stand size class	*Area*		*Cumulative %*
Old growth sawtimber	21,493	9	9
Young growth sawtimber	116,601	48	57
Poletimber	62,129	26	83
Seedling-sapling	36,629	15	98
Nonstocked	5,424	2	100

Even though such a large proportion of the CFL is classed as sawtimber, board foot volumes per acre are relatively low; 96 percent of the area is carrying stands with volumes less than 10,000 bd.ft. per acre. The board foot-cubic foot ratio of 4.4 indicates that the average size of trees in these stands is relatively small.

Ninety-eight percent of the CFL is stocked with trees...

Stocking -- Only 5,400 acres (2 percent of the total) are considered nonstocked. No doubt part of the nonstocked area is unable to support trees and its burned sections lack sufficient seed to naturally restock such areas within a reasonable period.

However, having 98 percent of the CFL area classed as stocked doesn't mean there are just the right number of trees nor that only good trees are included. Eleven percent of the area actually capable of growing trees is either bare or is occupied by cull trees:

but some acres have too few trees, some have too many.

Stockable area	*Area occupied by* Growing stock trees	Cull trees	No trees[5]
	Acres		
211,482	188,110	3,490	19,882
% of total	89	2	9

Both situations are equally unproductive for timber.

An acre 60 percent stocked with growing stock trees is considered to have an adequate number of trees. About 33,000 acres of CFL are less than 50 percent stocked with live trees and some 64,000 acres are less than 60 percent stocked with growing stock trees. An estimated 40,000 acres have more growing stock trees than are needed to use the site effectively.

Inadequate stocking is tough to deal with except over a longer time frame.

The latter condition is somewhat easier to deal with in a short time frame. A thinning program can bring overstocked stands into a more productive condition rather quickly and is consistent with other management goals. Understocked areas are not so easily dealt with, especially small treeless areas scattered through the forest. Over time, many such areas will "grow" into a more desirable condition and better utilize the site. They can also be planted, but at considerable cost. Planting, however, is much used to restock larger areas without a sufficient seed source.

Much of the CFL will be under some even-aged management system, with a two-cut shelterwood harvest to regenerate the stand.

Stand Density and Structure.--One of the objectives of the State's planned forestry program is to bring the State and privately owned CFL under full management and full regulation within 30 years through its public assistance program. Although many kinds of silvicultural treatments can be used (depending on the nature and condition of existing unmanaged stands), most will take advantage of the tendency of ponderosa pine to establish itself in even-aged stands. Intermediate harvest every 20 years with a two-cut shelterwood regeneration cut at final harvest is the system generally thought most appropriate for ponderosa pine in the Black Hills (1, 3).

[5]This area represents open areas in sparse stands in which trees could grow.

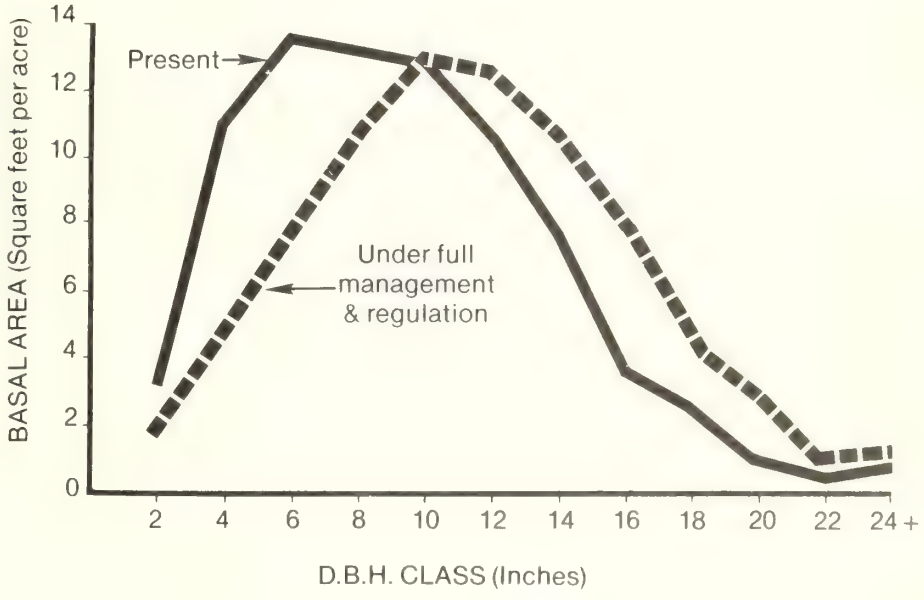
verage stand
ensity is
bout 80 ft^2
f basal area
er acre...

Once the acreage of CFL is all under management, it would be occupied by individual stands of different ages and tree sizes. On a per-acre basis, the average of all these stands would have a density of about 80 ft^2 basal area distributed among the diameter classes as shown by the dotted line.

ut, there is
ore in small-
ize trees
han desired.

Currently, the average of all stands (some managed and some not), is about 80 ft^2 of basal area but distributed by diameter classes as shown by the solid line.

The apparent imbalance in basal area distribution indicates both the existence of stands needing thinning and the fact that the forest is not yet in a fully regulated condition.



Square-foot basal area by diameter class for the average acre.

When fully regulated, only 30 percent of the total basal area will be in trees less than 10 inches in diameter.

In a fully regulated situation where a variety of roundwood materials (pulp, poles, and saw logs) are product objectives, the basal area in trees less than 10 inches d.b.h. should be about 40 percent of that in trees 10 inches d.b.h. and larger; or, 30 percent of the total basal area (6).

Currently the average stand has 40.6 ft^2 basal area (about 50 percent) in trees less than 10 inches d.b.h.

A continued thinning program, emphasizing removal of smaller trees, is needed.

Removing more of the smaller diameter trees (thinning from below) automatically will increase average stand diameter. Normal tree growth, during the period between thinnings will increase the diameter of residual trees and, therefore, the basal area in each diameter class.

Nontimber benefits achieved through timber management activities stretch the nontimber resource management dollars.

Fewer but larger trees will be the result and will create a more open forest capable of meeting both timber production and other management objectives. In addition, maintaining the vigor of young stands will help control mountain pine beetles and reduce mortality losses.

Heavy thinning in stagnated stands can produce some startling results.

As an example of what thinning stagnated stands can do, Boldt (2) reported in a case study in 1970 some startling results of a sequential thinning effort. A 70-year-old stand containing 2,000 trees per acre, with an average diameter of 4.2 inches was thinned from below to 476 trees, then 7 years later to 105 trees. The result: in an 11-year period, removal of smaller trees increased diameter growth of remaining trees, and a stagnated sapling stand was transformed into a small sawtimber stand averaging 9.1 inches d.b.h.

Such a thinning program may not always be prudent, however, because of the susceptibility of residual trees to damage from snow or wind. A series of lighter cuts is usually recommended to reduce the likelihood of such losses (3).

There is a good case for thinning investments.

How good is an investment in precommercial and commercial thinnings? Although the forest land is not as productive as that of other timber-producing areas in the West, there are opportunities for generating both timber and nontimber values.

The major silvicultural requirement for growing timber is stocking control. The average cost for precommercial thinning in young stands is about $60 per acre. On an average site, a management regimen consisting of one precommercial thinning and three commercial thinnings to a growing stock level of 80 ft^2 would generate a total output of some 4,600 ft^3 per acre over a 100-year rotation. That is about 30 ft^3 per acre per year more than if no thinning were done. Also, an additional 20 cents per acre per year worth of forage would be produced. There are several ways to look at and interpret such an "opportunity."

If the annual harvest could be increased at the same rate as volume growth...

First, if there is sufficient old-growth sawtimber reserve, the "allowable cut effect" would indicate that an additional 30 ft^3 per year could be harvested for each acre brought under such a management regimen. Assuming a stumpage value of $0.25 per ft^3, that represents an increase in income per acre of $7.50 per year, in addition to the annual income from grazing estimated at $0.20 per acre per year.

If the rotation were 110 years and the thinning were done at 20 years, there are 90 years in which the grazing income and the additional wood values would be captured.

the rate of return on the $60 thinning is about 11 percent.

The rate of return on the initial $60 investment generating this series of annual incomes is 11.05 percent. But, again, remember this rate of return could be earned *only if the annual cut could be increased at the same rate as the expected average annual yield increase.*

If capturing the "allowable cut effect" is not possible, the rate of return is about 5 percent.

Given the following management schedules, in terms of the *difference* in yield between such a management program and the "do nothing but harvest" plan, the rate of return is about 5.05 percent:

A: With management.

Year	Stand Age	Activity	Volume Removed cu. ft.	Cost	Income*	Difference in: Volume Removed cu. ft.	Difference in: Net Cost or Income*
0	20	Precommercial thin	0	$60	0	0	-$60
20	40	Commercial thin	400	20	$100	400	+ 80
40	60	Commercial thin	500	20	125	500	+105
60	80	Commercial thin	700	20	175	700	+155
80	100	Harvest	1,500	30	375	800	+200
90	110	Harvest	1,500	30	375	900	+225
		Total	4,600	--	--		
All	All	Grazing	.10 AUM	0	.20		

B: With no management.

0	20	Nothing	0	0	0	--	--
80	100	Harvest	700	$30	$175	--	--
90	110	Harvest	600	30	150	--	--
		Total	1,300			--	--
All	All	Graze	.03 AUM	0	.06	--	--

*Assume stumpage value of $0.25/cubic foot.

Even though they cannot be measured in monetary terms, other key values--scenery, water yield, wildlife habitat, recreation, and fire hazard reduction--are also generated.

Gross growth is now 8 million ft^3 per year but could be increased.

Growth and Mortality -- Gross growth on State and private land is about 8 million ft^3 per year. A program to adequately stock the nonstocked or understocked area could increase the gross growth to about 11 million ft^3 annually.

Mortality is probably understated...

and so net growth may be less than estimated.

Mortality is difficult to estimate, especially with the inventory procedures used. Also, increased insect activity since the inventory has made a substantial increase in the number of trees dying, and therefore, a reduction in net growth. There is some evidence that mortality actually may be 3 or 4 times that calculated from the basic inventory data.

The estimated annual mortality of softwood growing stock and major causes are:

	M ft³
Insects	72
Disease	56
Weather	36
Other	25
Total	189

Opportunities for Increasing Timber Supplies

Future timber supplies will be influenced by land use objectives of owners and by bringing additional areas of CFL under management.

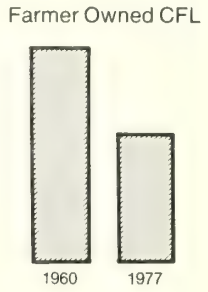
Basic factors that will influence future timber supplies from State and private lands include: (a) land use policies and programs for joint resource use on State lands; (b) objectives of nonindustrial private timberland owners; (c) technical advances in logging and utilization to bring currently inoperable areas under management; and (d) management money for stocking control.

Management objectives for State-owned land have been established.

A fully integrated resource use and protection posture is State policy, and land use policies and management objectives are already established. Management will be directed toward enhancing scenic values, recreation opportunities, and critical winter range for deer and elk, toward protecting the critical watersheds, reducing wildfire hazards, controlling mountain pine beetles, and maintaining the timber stands in a productive condition. Proposed timber supplies that reflect these nontimber land use objectives have been established for these lands and are included in the county timber management plans.

Objectives of non-industrial private owners vary, and can change.

The intent of small private owners, largely farmers, who hold much of the non-Federal CFL is an important matter. Although cutting has been increasing on such lands, substantial areas of otherwise productive forest land are being withdrawn from timber use in favor of summer or year-round homesite development. In 1960, the area of CFL in farmer ownership was estimated at 224,000 acres, some 70,000 acres more than 1977 (4).



Increased wood prices could bring inoperable areas under management.

The CFL now considered inoperable supports a good supply of timber. Harvesting it without damage to other important resources is not possible at the present. The price of wood will influence the speed with which cable, balloon, or helicopter techniques will invade the Black Hills

Access to timber is good.

Access is not much of a problem. Almost all the CFL is within 5 miles of a haul road and 90 percent is less than 1.5 miles of an existing road. In addition, 90 percent of the CFL is within 35 miles of a sawmill or other wood-processing plant. Access to railroads is not quite as good.

Regeneration is a natural...

but usually comes in too great numbers.

Probably the most critical issue for future timber supplies has to do with stocking control. Regeneration in cutover stands is generally of little concern to managers after harvest. The frequent heavy seed crops combined with timely and abundant spring and summer precipitation make overstocking of seedlings the rule (1, 2, 3). Forty thousand seedlings per acre are not uncommon.

Continued thinnings will be necessary...

Such constant and heavy regeneration makes thinning a necessity for sustaining a reasonable growth rate and concentrating the growth on larger more valuable trees.

and much material will be available for pulp, posts, and poles.

Intermediate thinnings pay for themselves through pulp, posts, and pole sales. The usual management regimen is a precommercial thinning, additional entries for commercial thinning every 20 years, and ending with two shelterwood cuts for regeneration.

A major increase in timber output would mean giving up other forest values.

In Total -- Aside from making maximum timber output the sole objective of forest management (which would mean giving up much, if not all, the nontimber values now being generated), there are only a few ways supplies from State and private forest lands will be increased. First, there needs to be a...

Markets for merchantable material and management money are key items for...

■ Continued program of stocking control. Precommercial and commercial thinnings are requirements to maintain or increase output. Again, maintaining and expanding markets now for merchantable small materials are necessary to avoid a slowdown in otherwise commercial thinnings. Such thinnings on behalf of growing sawtimber trees make total

continued and increased stocking control.

management less expensive (net income rather than net cost action) and reduce the volume of usable wood left lying in the woods. Which brings up...

Better utilization...

■ Increased utilization. Better utilization of usable wood during logging operations could increase wood supplies. Present logging residues are estimated to be about 700,000 ft^3 per year.

Mill residues are being well utilized at the present except for sawdust and shavings. Slabs, edgings, and trimmings are being converted into chips and most of the bark is being utilized (11). But, meanwhile, back in the woods, there are lots of...

and cutting more usable dead wood will help.

■ Salvable dead trees. The volume of products realized from dead trees could be increased. In 1974, the total of such volume was 114,000 ft^3 for all ownerships. That represents only 0.2 percent of the total volume of salvable dead material. If more such trees could be economically removed, not only would timber supplies be increased, but there would also be room for...

Three-fourths of CFL area is producing all the growing stock growth.

Replacing slow or no-growth trees with GS trees would theoretically increase output about 4 million ft^3 per year.

■ More growing stock trees. It is estimated that only about 183,000 acres (75 percent of total) of State and private CFL are occupied with growing stock (GS) trees. The open area and that occupied by cull or dead trees and stagnated stands contribute little to current growth. In effect then, the approximately 8 million ft^3 of gross growth is being generated on three-fourths of the area. It would seem reasonable that getting the nonproducing area stocked with growing stock trees would increase growth and therefore supplies of timber. The theoretical possibility is that the potential of 12 million ft^3 per year can be achieved.

Here is a situation that is, however, probably only masquerading as a 4 million ft^3 opportunity. Nearly a third of the CFL is now inoperable and the acreage of the inoperable area not stocked with GS trees is not known. Also, establishing more GS trees on understocked operable areas can only happen gradually over the next 30 years, the planned period for achieving regulation. In the long run, the biggest opportunity for increasing supplies is to...

But it probably won't happen for at least 30 years.

Logging techniques not now being used in western South Dakota...

■ Bring as many inoperable areas as possible under management. The areas totaling 90,000 acres now included in the "inoperable" category have the potential to grow nearly 3 million ft^3 per year. Probably not all such areas can be brought under management. But, getting even part of the potential will require two important things: logging techniques not now being used to manage the new stands and money.

and more management money are the keys to capturing wood from the now inoperable area.

Such high-priced methods as balloon, cable, or helicopter logging will result in higher prices for the products generated. More management money will be required. It costs more to operate on steep slopes than on flat ground. Also, there will be more acres to treat annually once the steeper slopes in the inoperable area are opened up.

ABOUT THE BLACK HILLS NATIONAL FOREST

Resource Use and Management Direction

Planned management of the timber resources of the Black Hills National Forest will...

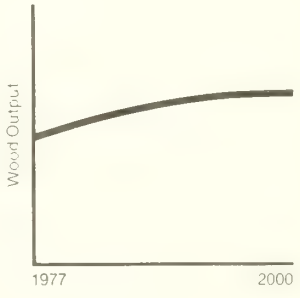
Use and management of the resources of the Black Hills National Forest are directed toward sustaining the high quality environment while capturing the multiple benefits potentially available from the existing resources (12).

Major objectives are to enhance key values of scenery, recreation, and wildlife, as well as providing timber, watershed, and range values. And one of the most important vehicles for achieving these goals is manipulating the timber resource.

Consequences of Timber Management

increase timber output to 190 million bd.ft...

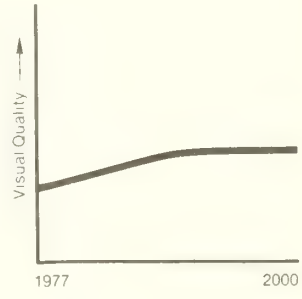
The timber management proposed for the Black Hills National Forest[6] will result in an annual output of 36 million ft^3 of roundwood, (190 million bd.ft. Scribner rule or 213 million, International 1/4-inch rule), a substantial increase over current output (152 million bd.ft. Scribner). All associated resource values will be affected in a positive way, even though planned timber output will not reach as high a level as would be possible if the goal were to maximize timber production.



Recreation

provide more varied and pleasing landscape...

Recreational use of the National Forest is expected to rise to an estimated 3 million visitor-days by 1990. Scenery is important to Black Hills visitors, else they would not be there. Increased harvesting and thinning will reduce the visual monotony of dense stands and create a more varied landscape.



[6]The effects of management are from the final Environmental Impact Statement for the timber management plan on the Black Hills National Forest (12).

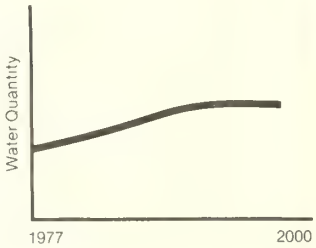
Water

increase water supplies by 7,500 acre feet...

Reducing stand densities will provide more water. Planned management is estimated to increase surface flow by 2,000 acre-feet per year and subsurface water by about 5,500 acre-feet during a year of average rainfall. More snow will reach the ground and drift. This will result in a slower and larger addition to streamflows in the spring.

Grazing and Wildlife

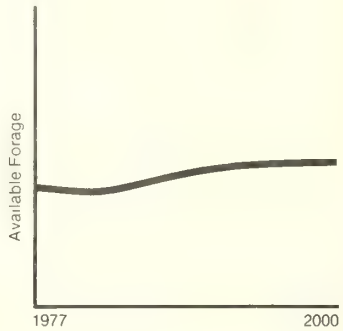
Planned management activities for the timber will increase both the acreage available for livestock grazing and the amount of herbage produced. Also, wildlife habitat will increase in area and quality. The values so generated by increased tree removals are substantial.



double big game browse and provide a threefold increase in grazing potential...

To maximize wood output, stands should be maintained at about 120 to 140 ft^2 of basal area per acre. At such density, herbage production is only about 60 pounds per acre (9, 12). If a cow could walk through such a stand, she would need about 32 acres of it to feed herself and her calf for a month, at the recommended utilization rate of 40 percent.

At the planned stand density of about 80 ft^2 of basal area, there will be 260 pounds of herbage per acre (9, 12), requiring only about 10 acres to feed them for a month. That is more than a threefold increase in grazing capacity over that from a program to maximize wood output. In addition, wildlife browse production will double to 40 pounds per acre per year.

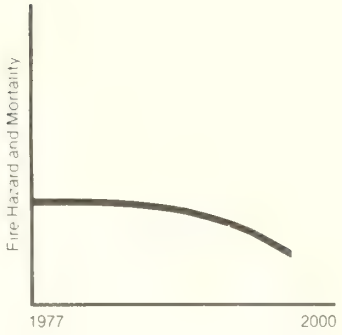


Other Effects

and reduce mortality from pine beetles and potential loss to wildfires.

The proposed timber management plan would also help control the present mountain pine beetle outbreak and reduce chances for future losses by increasing the vigor of stands susceptible to attack. The overall effect would be to reduce mortality and increase net growth.

In addition, the potential for destructive wildfires will be reduced and so also the probability of loss of timber and associated resource values.



Key Issues for Future

The key issues are maintaining markets for small-size trees...

The prospects for the future of the resources of the Black Hills National Forest pivot on the same basic issues as for State and private lands: markets and management money.

If lack of markets for small trees slack off, thinning may become more costly. Fewer acres would be treated annually and the total benefits associated with the scheduled thinning would be reduced.

and adequate management money.

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APPENDIX

Glossary and Tables

Glossary

Land Use Classes

Forest land — Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparison of basal area and/or number of trees, by age or size and spacing with specified standards. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 ft to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 ft in width.) Also see definitions for land area, commercial forest land, stocking, unproductive forest land, and water.

Commercial forest land. — Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization (Note: Areas qualifying as commercial forest land have the capability of producing in excess of 20 ft^3 per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production and industrial wood in the foreseeable future.)

Deferred forest land — National Forest lands that meet productivity standards for commercial forest, but are under study for possible inclusion in the Wilderness System.

Unregulated forest land — Portions of commercial forest land and the noncommercial forest land that will not be utilized for sustained timber production.

Noncommercial forest land — (1) Unproductive forest land incapable of yielding crops of industrial wood because of adverse site conditions, and (2) productive-reserved forest land.

Productive-reserved forest land — Forest land sufficiently productive to qualify as commercial forest land, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Unproductive forest land — Forest land incapable of producing 20 ft^3 per acre of industrial wood under natural conditions, because of adverse site conditions. (Note: Adverse conditions include sterile soils, dry climate, poor drainage, high elevation, steepness, and rockiness.)

Nonforest land — Land that has never supported forests and lands formerly forested where use for timber management is prevented by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 40-acre areas

of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 ft wide and clearings more than 1 acre in size to qualify as nonforest land.)

Ownership Classes

Ownership — Property owned by one owner, regardless of the number of parcels in a specified area.

National Forest land — Federal lands that have been legally designated as National Forest or purchase units and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands — Federal land administered by the Bureau of Land Management.

Miscellaneous Federal lands — Federal lands other than National Forest lands, lands administered by the Bureau of Land Management, and Indian lands.

Other Federal lands — Federal lands other than National Forest lands, including lands administered by the Bureau of Land Management, Bureau of Indian Affairs, and other Federal agencies.

State, county, and municipal lands — Lands owned by States, counties, and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Other public — All Federal lands other than National Forest lands, and State, county, and municipal lands.

Farmer-owned lands — Lands owned by farm operators. (Note: These exclude land leased by farm operators from nonfarm owners, such as railroad companies and States.)

Forest industry lands — Lands owned by companies or individuals operating wood-using plants.

Forest Type and Tree Species

Forest types — A classification of forest land based upon the species forming a plurality of live-tree stocking. (Note: Types shall be determined on the basis of species plurality of all live trees that contribute to stocking; that is, up to a maximum of 16 percent at each plot point based upon a 10-point location.)

Major forest type — A grouping of local forest types into about 10 eastern and 10 western groups. The groupings are based upon similar and associated species.

Commercial species — Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality, such as hawthorn and sumac, scrub willow, and alder.)

Noncommercial species

Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Softwoods

Coniferous trees, usually evergreen having needles or scalelike leaves.

Hardwoods

Dicotyledonous trees, usually broad-leaved and deciduous.

Class of Timber

Growing stock trees

Live trees of commercial species meeting specified standards of quality or vigor; excludes cull trees.

Rough trees

(1) Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 ft long or longer--now or prospectively--and/or do not meet regional specifications for freedom from defect primarily because of roughness or poor form; (2) all live trees of noncommercial species.

Rotten trees

Live trees of commercial species that do not contain at least one 12-foot saw log, or two noncontiguous saw logs, each 8 ft long or longer--now or prospectively--and/or do not meet regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume in a tree is rotten.

Cull

Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Salvable dead trees

Standing or down dead trees that are considered merchantable by regional standards.

Mortality trees

Growing stock trees dying from natural causes during a specified period, usually annually.

Diameters and Size Classes

Diameter classes

A classification of trees based on diameter outside bark, measured at breast height (4-1/2 ft above the ground). (Note: "d.b.h." is the common abbreviation for diameter at breast height. Two-inch diameter classes are commonly used in Forest Survey, with the even inch the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h., inclusive.)

Tree size class

A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, and saplings and seedlings.

Seedlings

Live trees less than 1.0 inch d.b.h.

Saplings

Trees 1.0 to 5.0 inches d.b.h.

Poletimber trees

Trees at least 5.0 inches d.b.h., but smaller than sawtimber size.

Sawtimber trees

Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches and for hardwoods 11.0 inches.

Volume

Net volume

Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Growing stock volume

Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0 inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

International 1/4-inch rule

The standard board-foot log rule adopted nationally by the Forest Service for the presentation of Forest Survey volume statistics.

Growth and Mortality

Gross growth

Annual increase in net volume of trees in the absence of cutting and mortality. The total includes ingrowth and accretion.

Net annual growth

The increase in net volume of a specified size class for a specific year. (Note: Components of net annual growth include the increment in net volume of trees at the beginning of the specific year that survive to the year's end, plus the net volume of trees that reach the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten during the year.)

Mortality

Number of sound-wood volume growing stock trees dying from natural causes during a specified period.

Timber Cut

Allowable cut

The volume of timber that could be cut on commercial forest land during a given period under specified management plans aimed at sustained production of timber products.

Timber removals

The net volume of growing stock trees, removed from the inventory by harvesting, or by such cultural operations as timber-stand improvement, land clearing, or changes in land use.

Timber products

Roundwood products and plant byproducts. (Note: Timber products output includes roundwood products cut from growing stock on commercial forest land, and from other sources, such as cull trees, salvable dead trees, limbs, and saplings, or from trees on noncommercial and nonforest lands, and from plant byproducts.)

Roundwood products

Logs, bolts, or other round sections cut from trees for industrial or consumer uses. (Note: Includes saw logs, veneer logs, and bolts, cooperage logs and bolts, pulpwood, fuelwood, piling, poles, hewn ties, mine timbers, and various other round, split, or hewn products.)

Plant residues

Wood materials from manufacturing plants not utilized for some product. (Note: Includes slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screenings.)

Logging residues

The unused portions of trees cut or killed by logging.

Other removals

The net volume of growing stock trees removed from the inventory by cultural operations, such as timber stand improvements, land clearing, and changes in land use.

Rotation

The period of years between establishment of a stand of timber and the time when it is considered to be ready for cutting and regeneration.

Quality

Industrial wood

All roundwood products, except fuelwood.

Site

Site class

A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean annual growth of growing stock (not including thinnings) attainable in fully stocked stands at culmination of mean annual growth. Height-age relationships are usually used as indicators of the specified volume-site class.

Stand Size Classes

Stand-size class

A classification of forest land based on the size class of growing stock trees on the area, that is, sawtimber, poletimber, or seedlings, and saplings. (Note: Only those trees that contribute to no more than 16 percent stocking at a plot point, based upon a 10-point location, will be considered in determining stand-size class.)

Sawtimber stands

a. Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands

b. Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands

c. Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and/or seedlings.

Nonstocked land

d. Commercial forest land less than 16.7 percent stocked with growing stock trees.

Stand Density and Stocking

Stand density

A quantitative measure of a stand in terms of square feet of basal area, number of trees, or volume per acre. It reflects the degree of crowding of stems within the area.

Stocking

A relative term used to describe the adequacy of a given stand density in meeting the management objectives.

Basal area

The cross-sectional area of a tree stem, in square feet, at a point 4.5 ft above the ground. Basal area per acre is the sum of the basal areas of all the trees on the acre.

Growing stock level

Basal area (square feet) per acre that will remain after thinning when average stand diameter is 10 inches or more.

Table 1.--*Land area by county and major land class; western South Dakota, 1977*

County[1]	Total land area[2]	Total forest land area	Commercial timberland	All other forest land			Nonforest land area[3]
				Productive reserved	Other forest reserved	Other forest nonreserved	
	Thousand acres						
Butte, Harding, Meade	3,712.4	103.3	82.9	--	--	20.4	3,609.1
Custer	879.3	398.3	362.1	10.0	.2	26.0	481.0
Fall River	1,115.6	93.3	57.5	--	--	35.8	1,022.3
Lawrence	512.0	351.8	334.8	--	--	17.0	160.2
Pennington	659.5	420.6	409.5	1.1	1.1	8.9	238.9
Total	6,878.8	1,367.3	1,246.8	11.1	1.3	108.1	5,511.5
Percent of total	100.0	19.9	18.1	.2	([4])	1.6	80.1

[1]This and all later tables include only the portions of Custer, Meade, and Pennington Counties west of the 103rd meridian.

[2]From U.S. Bureau of the Census, Land and Water Area of the United States, 1970.

[3]Includes 8,300 acres classed as water by Renewable Resources Evaluation standards, but defined as land by the Bureau of the Census.

[4]Less than 0.05 percent.

Table 2.--*Area of commercial timberland by ownership class and county; western South Dakota, 1977*

Ownership class	COUNTY					Total
	Butte, Harding, Meade	Custer	Fall River	Lawrence	Pennington	
	Thousand acres					
National Forest	44.2	262.2	19.4	259.3	367.4	952.5
BLM	1.3	0.8	0.3	5.1	--	7.5
Indian	--	--	--	--	--	--
Miscellaneous federal	--	--	0.5	--	0.5	1.0
State	5.0	55.7	3.0	2.4	0.9	67.0
County and municipal	0.1	--	--	2.1	1.2	3.4
Forest industry[1]	--	--	--	--	--	--
Farmer	18.6	41.8	29.1	36.7	28.4	154.6
Miscellaneous private	13.7	1.6	5.2	29.2	11.1	60.8
All ownerships	82.9	362.1	57.5	334.8	409.5	1,246.8

[1]Forest industry has been combined with Miscellaneous private to avoid disclosure of an individual owner, on this and all tables that follow.

Table 3.--Area of commercial timberland by county, owner group, forest type, stand-size class, and site class, western South Dakota, 1977

County	Forest type and stand-size class	National Forest						Other public						Forest industry						Other private						All ownerships					
		Site class						Site class						Site class						Site class						Site class					
		165+	120-164	85-119	50-84	20-49	Total	165+	120-164	85-119	50-84	20-49	Total	165+	120-164	85-119	50-84	20-49	Total	165+	120-164	85-119	50-84	20-49	Total	165+	120-164	85-119	50-84	20-49	Total
		Thousand acres																													
Butte, Harding, Meade	Ponderosa pine:																														
	Sawtimber	--	--	(1)	5.1	20.4	25.5	--	--	--	0.3	2.2	2.5	--	--	--	--	--	--	--	--	--	2.7	10.6	13.3	--	--	(1)	8.1	33.2	41.3
	Poletimber	--	--	--	1.7	12.7	14.4	--	--	--	.2	2.0	2.2	--	--	--	--	--	--	--	--	--	.9	10.0	10.9	--	--	--	2.8	24.7	27.5
	Sapling and seedling	--	--	--	.9	2.3	3.2	--	--	--	--	.5	.5	--	--	--	--	--	--	--	--	--	--	2.4	2.4	--	--	--	.9	5.2	6.1
	Nonstocked	--	--	--	(1)	.1	.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	(1)	.1	.1
	Total	--	--	(1)	7.7	35.5	43.2	--	--	--	.5	4.7	5.2	--	--	--	--	--	--	--	--	--	3.6	23.0	26.6	--	--	(1)	11.8	63.2	75.0
	Fir-spruce:																														
	Sawtimber	--	--	0.1	.2	(1)	.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	.2	(1)	.3
	Poletimber	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	.1	.2	(1)	.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.1	.2	(1)	.3
	Hardwoods:																														
	Sawtimber	--	--	--	.2	.3	.5	--	--	--	.1	.7	.8	--	--	--	--	--	--	--	--	--	.5	3.8	4.3	--	--	--	.8	4.8	5.6
	Poletimber	--	--	--	--	.2	.2	--	--	--	--	.3	.3	--	--	--	--	--	--	--	--	--	--	.9	.9	--	--	--	--	1.4	1.4
	Sapling and seedling	--	--	--	--	(1)	(1)	--	--	--	--	.1	.1	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	.6	.6
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	--	.2	.5	.7	--	--	--	.1	1.1	1.2	--	--	--	--	--	--	--	--	--	.5	5.2	5.7	--	--	--	.8	6.8	7.6
	All forest types:																														
	Sawtimber	--	--	.1	5.5	20.7	26.3	--	--	--	.4	2.9	3.3	--	--	--	--	--	--	--	--	--	3.2	14.4	17.6	--	--	.1	9.1	38.0	47.2
	Poletimber	--	--	--	1.7	12.9	14.6	--	--	--	.2	2.3	2.5	--	--	--	--	--	--	--	--	--	.9	10.9	11.8	--	--	--	2.8	26.1	28.9
	Sapling and seedling	--	--	--	.9	2.3	3.2	--	--	--	--	.6	.6	--	--	--	--	--	--	--	--	--	--	2.9	2.9	--	--	--	.9	5.8	6.7
	Nonstocked	--	--	--	(1)	.1	.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	(1)	.1	.1
	Total	--	--	.1	8.1	36.0	44.2	--	--	--	.6	5.8	6.4	--	--	--	--	--	--	--	--	--	4.1	28.2	32.3	--	--	.1	12.8	70.0	82.9
Custer	Ponderosa pine:																														
	Sawtimber	--	--	.9	20.1	162.2	183.2	--	--	--	2.3	33.6	35.9	--	--	--	--	--	--	--	--	--	1.4	16.4	17.8	--	--	.9	23.8	212.2	236.9
	Poletimber	--	--	--	--	65.4	65.4	--	--	--	.1	6.5	6.6	--	--	--	--	--	--	--	--	--	.5	10.9	11.4	--	--	--	.6	82.8	83.4
	Sapling and seedling	--	--	--	--	9.4	9.4	--	--	--	(1)	12.9	12.9	--	--	--	--	--	--	--	--	--	1.0	12.2	13.2	--	--	--	1.0	34.5	35.5
	Nonstocked	--	--	--	--	.1	.1	--	--	--	--	1.1	1.1	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	1.7	1.7
	Total	--	--	.9	20.1	237.1	258.1	--	--	--	2.4	54.1	56.5	--	--	--	--	--	--	--	--	--	2.9	40.0	42.9	--	--	.9	25.4	331.2	357.5
	Fir-spruce:																														
	Sawtimber	--	--	.7	2.8	.1	3.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.7	2.8	.1	3.6
	Poletimber	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	.7	2.8	.1	3.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.7	2.8	.1	3.6
	Hardwoods:																														
	Sawtimber	--	--	--	.1	.3	.4	--	--	--	--	(1)	(1)	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	.1	.8	.9
	Poletimber	--	--	--	--	(1)	(1)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	(1)	(1)
	Sapling and seedling	--	--	--	--	.1	.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.1	.1
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	--	.1	.4	.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	.1	.9	1.0
	All forest types:																														
	Sawtimber	--	--	1.6	23.0	162.6	187.2	--	--	--	2.3	33.6	35.9	--	--	--	--	--	--	--	--	--	1.4	16.9	18.3	--	--	1.6	26.7	213.1	241.4
	Poletimber	--	--	--	--	65.4	65.4	--	--	--	.1	6.5	6.6	--	--	--	--	--	--	--	--	--	.5	10.9	11.4	--	--	--	.6	82.8	83.4
	Sapling and seedling	--	--	--	--	9.5	9.5	--	--	--	(1)	12.9	12.9	--	--	--	--	--	--	--	--	--	1.0	12.2	13.2	--	--	--	1.0	34.6	35.6
	Nonstocked	--	--	--	--	.1	.1	--	--	--	--	1.1	1.1	--	--	--	--	--	--	--	--	--	--	.5	.5	--	--	--	--	1.7	1.7
	Total	--	--	1.6	23.0	237.6	262.2	--	--	--	2.4	54.1	56.5	--	--	--	--	--	--	--	--	--	2.9	40.5	43.4	--	--	1.6	28.3	332.2	362.1

[1]Less than 50 acres.

Table 3 (con.)

County	Forest type and stand-size class	National Forest: Site class 165+	120-164	85-119	50-84	20-49	Total	Other public: Site class 165+	120-164	85-119	50-84	20-49	Total	Forest industry: Site class 165+	120-164	85-119	50-84	20-49	Total	Other private: Site class 165+	120-164	85-119	50-84	20-49	Total	All ownerships: Site class 165+	120-164	85-119	50-84	20-49	Total
		Thousand cubic																												
Fall River	Ponderosa pine																													
	Sawtimber	--	--	0.1	0.8	12.2	13.1	--	--	--	--	1.8	1.8	--	--	--	--	--	--	--	--	--	--	16.0	16.0	--	--	0.1	0.8	30.0	30.9
	Poletimber	--	--	--	--	5.6	5.6	--	--	--	(1)	.7	.7	--	--	--	--	--	--	--	--	--	.5	6.3	6.8	--	--	--	.5	12.6	13.1
	Sapling and seedling	--	--	--	--	.5	.5	--	--	--	--	.8	.8	--	--	--	--	--	--	--	--	--	--	7.1	7.1	--	--	--	--	8.4	8.4
	Nonstocked	--	--	--	--	--	--	--	--	--	0.1	.4	.5	--	--	--	--	--	--	--	--	--	.5	3.4	4.4	--	--	--	.6	4.3	4.9
	Total	--	--	.1	.8	18.3	19.2	--	--	--	.1	3.7	3.8	--	--	--	--	--	--	--	--	--	1.0	33.3	34.3	--	--	.1	1.9	55.3	57.3
	Fir-spruce																													
	Sawtimber	--	--	(1)	.2	--	.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	(1)	.2	--	.2
	Poletimber	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	(1)	.2	--	.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	(1)	.2	--	.2
	Hardwoods																													
	Sawtimber	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Poletimber	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	All forest types																													
	Sawtimber	--	--	.1	1.0	12.2	13.3	--	--	--	--	1.8	1.8	--	--	--	--	--	--	--	--	--	--	16.0	16.0	--	--	.1	1.0	30.0	31.1
	Poletimber	--	--	--	--	5.6	5.6	--	--	--	(1)	.7	.7	--	--	--	--	--	--	--	--	--	.5	6.3	6.8	--	--	--	.5	12.6	13.1
	Sapling and seedling	--	--	--	--	.5	.5	--	--	--	--	.8	.8	--	--	--	--	--	--	--	--	--	--	7.1	7.1	--	--	--	--	8.4	8.4
	Nonstocked	--	--	--	--	--	--	--	--	--	0.1	.4	.5	--	--	--	--	--	--	--	--	--	.5	3.4	4.4	--	--	--	.6	4.3	4.9
	Total	--	--	.1	1.0	18.3	19.4	--	--	--	.1	3.7	3.8	--	--	--	--	--	--	--	--	--	1.0	33.3	34.3	--	--	.1	1.9	55.3	57.5
Lawrence	Ponderosa pine																													
	Sawtimber	--	--	.1	.7	146.2	147.0	--	--	--	.7	4.0	4.7	--	--	--	--	--	--	--	--	--	4.1	28.1	32.2	--	--	.1	33.0	178.1	211.2
	Poletimber	--	--	--	--	58.0	58.0	--	--	--	.1	1.1	1.2	--	--	--	--	--	--	--	--	--	1.1	6.2	7.3	--	--	--	1.2	65.3	66.5
	Sapling and seedling	--	--	--	--	9.1	9.1	--	--	--	.2	.4	.6	--	--	--	--	--	--	--	--	--	1.1	3.3	4.4	--	--	--	1.1	13.4	14.5
	Nonstocked	--	--	--	--	1.0	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	1.0
	Total	--	--	.1	.7	214.3	215.1	--	--	--	.9	5.5	6.4	--	--	--	--	--	--	--	--	--	6.3	37.6	43.9	--	--	.2	34.3	257.8	292.2
	Douglas-fir																													
	Sawtimber	--	--	.1	.2	1.3	1.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.1	3.1	4.2	--	--	.1	--	4.4	4.7
	Poletimber	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	.1	.2	1.3	1.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.1	3.1	4.2	--	--	.1	--	4.4	4.7
	Grand fir																													
	Sawtimber	--	--	--	.1	9.8	9.9	--	--	--	.1	1.7	1.8	--	--	--	--	--	--	--	--	--	.3	11.7	12.0	--	--	--	1.9	23.3	25.2
	Poletimber	--	--	--	--	1.2	1.2	--	--	--	.1	1.1	1.2	--	--	--	--	--	--	--	--	--	.1	1.1	1.2	--	--	--	2.4	3.4	5.8
	Sapling and seedling	--	--	--	--	1.1	1.1	--	--	--	.1	.1	.2	--	--	--	--	--	--	--	--	--	.1	.1	.2	--	--	--	.2	.4	.6
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	--	.1	12.1	12.2	--	--	--	.3	2.9	3.2	--	--	--	--	--	--	--	--	--	.5	12.9	13.4	--	--	--	4.5	27.1	31.6
	All species																													
	Sawtimber	--	--	1.1	1.0	157.3	159.4	--	--	--	1.1	5.7	6.8	--	--	--	--	--	--	--	--	--	5.5	43.1	48.6	--	--	1.1	44.1	186.4	231.6
	Poletimber	--	--	--	--	64.8	64.8	--	--	--	.2	1.8	2.0	--	--	--	--	--	--	--	--	--	1.6	7.4	9.0	--	--	--	3.6	74.2	77.8
	Sapling and seedling	--	--	--	--	10.7	10.7	--	--	--	.3	.5	.8	--	--	--	--	--	--	--	--	--	1.2	10.5	11.7	--	--	--	1.3	22.3	23.6
	Nonstocked	--	--	--	--	1.0	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	1.0
	Total	--	--	1.1	1.0	233.8	235.9	--	--	--	1.6	8.0	9.6	--	--	--	--	--	--	--	--	--	8.3	71.0	79.3	--	--	1.1	49.3	308.0	358.4

Table 3. (con.)

County	Forest type and stand-size class	National Forest					Other public					Forest Industry					Other private					All owners				
		Site class					Site class					Site class					Site class									
		165+	120-164	85-119	50-84	20-49	Total	165+	120-164	85-119	50-84	20-49	Total	165+	120-164	85-119	50-84	20-49	Total	165+	120-164	85-119	50-84	20-49	Total	165+	120-164	85-119	50-84	20-49	Total
Pennington	Ponderosa pine:																														
	Sawtimber	--	--	1.0	32.3	216.6	249.9	--	--	--	0.3	0.9	1.2	--	--	--	--	--	--	--	--	--	3.7	18.7	22.4	--	--	1	[illegible]	[illegible]	[illegible]
	Poletimber	--	--	--	--	90.3	90.3	--	--	--	.1	1.1	1.2	--	--	--	--	--	--	--	--	--	1.0	11.7	12.7	--	--	--	1.2	12.8	[illegible]
	Sapling and seedling	--	--	--	--	13.2	13.2	--	--	--	(1)	.2	.2	--	--	--	--	--	--	--	--	--	.1	1.4	1.5	--	--	--	[illegible]	[illegible]	[illegible]
	Nonstocked	--	--	--	--	.6	.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	1.0	32.3	320.7	354.0	--	--	--	.4	2.2	2.6	--	--	--	--	--	--	--	--	--	5.3	31.8	37.1	--	--	1	[illegible]	[illegible]	[illegible]
	Fir-spruce:																														
	Sawtimber	--	--	1.1	4.9	.9	6.9	--	--	--	(1)	--	(1)	--	--	--	--	--	--	--	--	--	.2	--	.2	--	--	1.1	[illegible]	[illegible]	[illegible]
	Poletimber	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	1.1	4.9	.9	6.9	--	--	--	(1)	--	(1)	--	--	--	--	--	--	--	--	--	.2	--	.2	--	--	1.1	[illegible]	[illegible]	[illegible]
	Hardwoods:																														
	Sawtimber	--	--	--	1.6	2.9	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6	[illegible]	[illegible]
	Poletimber	--	--	--	--	1.3	1.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sapling and seedling	--	--	--	--	.7	.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	--	1.6	4.9	6.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6	[illegible]	[illegible]	[illegible]
	All forest types:																														
	Sawtimber	--	--	2.1	38.8	220.4	261.3	--	--	--	.3	.9	1.2	--	--	--	--	--	--	--	--	--	4.1	18.7	22.8	--	--	2.1	[illegible]	[illegible]	[illegible]
	Poletimber	--	--	--	--	91.6	91.6	--	--	--	.1	1.1	1.2	--	--	--	--	--	--	--	--	--	1.0	11.7	12.7	--	--	--	1.2	12.8	[illegible]
	Sapling and seedling	--	--	--	--	13.9	13.9	--	--	--	(1)	.2	.2	--	--	--	--	--	--	--	--	--	.1	1.4	1.5	--	--	--	[illegible]	[illegible]	[illegible]
	Nonstocked	--	--	--	--	.6	.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	2.1	38.8	326.5	367.4	--	--	--	.4	2.2	2.6	--	--	--	--	--	--	--	--	--	5.2	31.8	37.0	--	--	2.1	45.1	[illegible]	[illegible]
All counties	Ponderosa pine:																														
	Sawtimber	--	--	2.6	83.8	556.6	643.0	--	--	--	3.6	42.3	45.9	--	--	--	--	--	--	--	--	--	11.4	84.8	96.2	--	--	[illegible]	[illegible]	[illegible]	[illegible]
	Poletimber	--	--	--	1.7	232.6	234.3	--	--	--	.5	11.4	11.9	--	--	--	--	--	--	--	--	--	4.1	48.6	52.7	--	--	--	[illegible]	[illegible]	[illegible]
	Sapling and seedling	--	--	--	.9	34.4	35.3	--	--	--	.2	14.8	15.0	--	--	--	--	--	--	--	--	--	.6	27.4	28.0	--	--	--	[illegible]	[illegible]	[illegible]
	Nonstocked	--	--	--	(1)	2.0	2.0	--	--	--	.1	1.5	1.6	--	--	--	--	--	--	--	--	--	--	4.4	4.4	--	--	--	[illegible]	[illegible]	[illegible]
	Total	--	--	2.6	86.4	825.6	914.6	--	--	--	4.4	70.0	74.4	--	--	--	--	--	--	--	--	--	16.1	165.1	184.1	--	--	[illegible]	[illegible]	[illegible]	[illegible]
	Fir-spruce:																														
	Sawtimber	--	--	2.5	13.6	2.3	18.4	--	--	--	.2	.5	.7	--	--	--	--	--	--	--	--	--	2.1	3.1	5.2	--	--	[illegible]	[illegible]	[illegible]	[illegible]
	Poletimber	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sapling and seedling	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	2.5	13.6	2.3	18.4	--	--	--	.2	.5	.7	--	--	--	--	--	--	--	--	--	2.1	3.1	5.2	--	--	[illegible]	[illegible]	[illegible]	[illegible]
	Hardwoods:																														
	Sawtimber	--	--	--	4.7	8.8	13.5	--	--	--	.5	2.4	2.9	--	--	--	--	--	--	--	--	--	4.3	16.3	20.6	--	--	--	[illegible]	[illegible]	[illegible]
	Poletimber	--	--	--	-	4.0	4.0	--	--	--	.1	.4	.5	--	--	--	--	--	--	--	--	--	.1	1.3	1.4	--	--	--	[illegible]	[illegible]	[illegible]
	Sapling and seedling	--	--	--	--	2.0	2.0	--	--	--	.1	.3	.4	--	--	--	--	--	--	--	--	--	.5	2.7	3.2	--	--	--	[illegible]	[illegible]	[illegible]
	Nonstocked	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	--	--	4.7	14.8	19.5	--	--	--	.7	3.1	3.8	--	--	--	--	--	--	--	--	--	5.3	20.8	26.1	--	--	--	[illegible]	[illegible]	[illegible]
	All forest types:																														
	Sawtimber	--	--	5.1	102.1	567.7	674.9	--	--	--	4.3	45.2	49.5	--	--	--	--	--	--	--	--	--	18.8	104.1	122.9	--	--	[illegible]	[illegible]	[illegible]	[illegible]
	Poletimber	--	--	--	1.7	236.6	238.3	--	--	--	.6	11.8	12.4	--	--	--	--	--	--	--	--	--	4.5	[illegible]	[illegible]	--	--	--	[illegible]	[illegible]	[illegible]
	Sapling and seedling	--	--	--	.9	36.4	37.3	--	--	--	.3	15.1	15.4	--	--	--	--	--	--	--	--	--	3.1	30.1	33.2	--	--	--	[illegible]	[illegible]	[illegible]
	Nonstocked	--	--	--	(1)	2.0	2.0	--	--	--	.1	1.5	1.6	--	--	--	--	--	--	--	--	--	.5	4.4	4.9	--	--	--	[illegible]	[illegible]	[illegible]
	Total	--	--	5.1	104.7	842.7	952.5	--	--	--	5.3	73.6	78.9	--	--	--	--	--	--	--	--	--	26.4	189.0	215.4	--	--	5.1	[illegible]	[illegible]	[illegible]

[1]Less than 50 acres.

Table 4.--[illegible]

County	All owner groups	National Forest	Other public	Forest industry	Other private	All owner groups	National Forest	Other public	Forest industry	Other private
	Thousand cubic feet					Thousand board feet				
Butte, Harding, [illegible]										
Softwoods	81,811	52,904	4,404	--	24,003	242,[illegible]	162,[illegible]	11,[illegible]	--	[illegible],4
Hardwoods	[illegible],[illegible]	[illegible]	227	--	1,976	7,[illegible]	[illegible]	53	--	6,811
All species	[illegible],[illegible]4	[illegible],[illegible]4	4,631	--	25,979	249,820	163,[illegible]	11,[illegible]	--	74,811
Custer										
Softwoods	4[illegible],[illegible]5	[illegible],[illegible]2	[illegible],[illegible]65	--	25,016	1,504,11[illegible]	1,[illegible],4[illegible]	[illegible],[illegible]3[illegible]	--	[illegible],[illegible]2[illegible]
Hardwoods	1,41[illegible]	[illegible],[illegible]3[illegible]	[illegible]2	--	2[illegible]8	486	[illegible]91	5	--	[illegible]
All species	[illegible],[illegible]3[illegible]	[illegible],[illegible]4[illegible]	[illegible],[illegible]6	--	[illegible],[illegible]54	1,504,6[illegible]	1,[illegible],[illegible]5[illegible]	[illegible],[illegible]43	--	[illegible],[illegible]4[illegible]
Fall River										
Softwoods	41,[illegible]2[illegible]	[illegible],[illegible]4[illegible]	1,[illegible]1[illegible]	--	16,[illegible]2[illegible]	123,[illegible]4[illegible]	[illegible],[illegible]4[illegible]	4,[illegible]2[illegible]	--	[illegible],[illegible]4[illegible]
Hardwoods	1[illegible]4	4[illegible]	[illegible]8	--	5[illegible]	[illegible],[illegible]4[illegible]	[illegible]4	[illegible]4	--	[illegible]4[illegible]
All species	41,[illegible]2[illegible]	[illegible],[illegible]3,[illegible]3[illegible]	1,[illegible]1[illegible]	--	[illegible]6,[illegible]3[illegible]	[illegible]23,[illegible]11	[illegible]4,[illegible]4[illegible]	[illegible],[illegible]4[illegible]	--	[illegible]3,[illegible]3[illegible]
Lawrence										
Softwoods	4[illegible],[illegible]4[illegible]	[illegible]2[illegible],[illegible]4[illegible]	[illegible]2,[illegible]3[illegible]	--	93,[illegible]2[illegible]	1,[illegible]26,[illegible]3[illegible]	1,[illegible]3[illegible],[illegible]4[illegible]	4[illegible],[illegible]21	--	[illegible]41,[illegible]3[illegible]
Hardwoods	[illegible],[illegible]6[illegible]	4,[illegible]24	[illegible]5[illegible]	--	3,84[illegible]	[illegible],54[illegible]	4,[illegible]1[illegible]	[illegible]11	--	[illegible],[illegible]4[illegible]
All species	4[illegible],[illegible]2[illegible]	[illegible]6[illegible],[illegible]12	[illegible]4,[illegible]4[illegible]	--	96,[illegible]1[illegible]	1,7[illegible],4[illegible]	1,[illegible]4[illegible],[illegible]4[illegible]	4[illegible],[illegible]3[illegible]	--	[illegible]42,[illegible]1[illegible]
[illegible]										
Softwoods	[illegible]6,[illegible]1[illegible]	[illegible]3[illegible],[illegible]2[illegible]	[illegible],[illegible]11	--	44,55[illegible]	[illegible],[illegible]00,[illegible]7[illegible]	1,[illegible]7[illegible],[illegible]1[illegible]	[illegible],[illegible]4[illegible]	--	[illegible]1[illegible],[illegible]6[illegible]
Hardwoods	[illegible],[illegible]6[illegible]	[illegible],[illegible]18[illegible]	[illegible]28	--	448	[illegible],373	2,[illegible]2[illegible]	4[illegible]	--	[illegible]7[illegible]
All species	[illegible],[illegible]2[illegible]	[illegible]41,[illegible]	[illegible],[illegible]3[illegible]	--	45,[illegible]07	[illegible],[illegible]04,14[illegible]	1,[illegible]77,[illegible]4	[illegible],[illegible]2	--	[illegible]1[illegible],[illegible]4
[illegible] [illegible]										
Softwoods	1,[illegible]3[illegible],7[illegible]	1,[illegible]44,[illegible]4	[illegible]7,[illegible]07	--	[illegible]02,[illegible]7[illegible]	[illegible],596,927	4,[illegible]9[illegible],[illegible]28	[illegible]2[illegible],[illegible]81	--	[illegible]3[illegible],[illegible]4[illegible]
Hardwoods	1[illegible],241	[illegible],[illegible]63	[illegible]64	--	6,[illegible]64	18,341	[illegible],38[illegible]	[illegible]1	--	1[illegible],34
All species	1,[illegible]1[illegible],[illegible]	1,[illegible]52,[illegible]67	[illegible]7[illegible],661	--	[illegible]09,522	[illegible],615,268	4,[illegible]98,914	[illegible],[illegible]3	--	[illegible]1[illegible],53[illegible]

[illegible] International 1/4-inch rule.

Table 5.--*Net volume of timber on commercial timberland by county, timber class, and softwoods and hardwoods; western South Dakota, 1978*

County	All timber classes			Growing stock			Sound cull trees			Rotten cull trees			Salvable dead trees		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	Thousand cubic feet														
Butte, Harding, Meade	86,582	83,109	3,473	83,814	81,311	2,503	1,543	825	718	338	103	235	887	870	17
Custer	454,378	448,978	5,400	437,890	436,480	1,410	7,489	3,998	3,491	1,125	626	499	7,874	7,874	--
Fall River	42,380	42,172	208	41,323	41,217	106	680	593	87	35	20	15	342	342	--
Lawrence	512,599	495,269	17,330	491,224	482,608	8,616	11,314	4,456	6,858	2,619	776	1,843	7,442	7,429	13
Pennington	609,623	600,940	8,683	588,809	585,153	3,656	7,949	4,277	3,672	2,218	863	1,355	10,647	10,647	--
All counties	1,705,562	1,670,468	35,094	1,643,060	1,626,769	16,291	28,975	14,149	14,826	6,335	2,388	3,947	27,192	27,162	30

Table 6.--*Net volume of growing stock on commercial timberland by county, diameter class, and species; western South Dakota, 1977*

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand cubic feet						
Butte, Harding, Meade							
5.0 - 6.9	9,267	106	9,373	126	277	403	9,776
7.0 - 8.9	14,280	185	14,465	56	286	342	14,807
9.0 - 10.9	16,633	180	16,813	18	220	238	17,051
11.0 - 12.9	13,463	126	13,589	2	201	203	13,792
13.0 - 14.9	11,407	138	11,545	--	107	107	11,652
15.0 - 16.9	7,109	80	7,189	--	31	31	7,220
17.0 - 18.9	4,083	70	4,153	--	112	112	4,265
19.0 - 20.9	2,390	43	2,433	--	50	50	2,483
21.0 - 22.9	863	41	904	--	122	122	1,026
23.0 - 24.9	513	9	522	--	97	97	619
25.0 - 26.9	266	--	266	--	204	204	470
27.0 - 28.9	35	--	35	--	--	--	35
29.0+	24	--	24	--	594	594	618
Total	80,333	978	81,311	202	2,301	2,503	83,814

Table 6 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand cubic feet						
Custer							
5.0 - 6.9	32,783	778	33,561	436	223	659	34,220
7.0 - 8.9	61,741	1,754	63,495	123	314	437	63,932
9.0 - 10.9	73,114	1,635	74,749	177	42	219	74,968
11.0 - 12.9	72,251	1,193	73,444	4	56	60	73,504
13.0 - 14.9	62,236	1,389	63,625	--	10	10	63,635
15.0 - 16.9	48,227	1,240	49,467	--	2	2	49,469
17.0 - 18.9	32,716	661	33,377	--	7	7	33,384
19.0 - 20.9	22,886	618	23,504	--	2	2	23,506
21.0 - 22.9	11,317	515	11,832	--	5	5	11,837
23.0 - 24.9	5,152	233	5,385	--	--	--	5,385
25.0 - 26.9	3,035	--	3,035	--	3	3	3,038
27.0 - 28.9	647	--	647	--	--	--	647
29.0+	359	--	359	--	6	6	365
Total	426,464	10,016	436,480	740	670	1,410	437,890

Table 6 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand cubic feet						
Fall River							
5.0 - 6.9	4,048	27	4,075	25	4	29	4,104
7.0 - 8.9	7,350	124	7,474	3	7	10	7,484
9.0 - 10.9	8,287	104	8,391	6	23	29	8,420
11.0 - 12.9	6,626	77	6,703	--	1	1	6,704
13.0 - 14.9	5,823	48	5,871	--	([1])	([1])	5,871
15.0 - 16.9	3,962	64	4,026	--	--	--	4,026
17.0 - 18.9	2,338	19	2,357	--	--	--	2,357
19.0 - 20.9	1,230	20	1,250	--	--	--	1,250
21.0 - 22.9	526	39	565	--	--	--	565
23.0 - 24.9	284	9	293	--	--	--	293
25.0 - 26.9	92	--	92	--	37	37	129
27.0 - 28.9	69	--	69	--	--	--	69
29.0+	51	--	51	--	--	--	51
Total	40,686	531	41,217	34	72	106	41,323

[1]Less than 0.5 thousand cubic feet.

Table 6 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand cubic feet						
Lawrence							
5.0 - 6.9	33,758	4,004	37,762	2,759	1,502	4,261	42,023
7.0 - 8.9	63,951	4,390	68,341	1,476	558	2,034	70,375
9.0 - 10.9	81,985	5,111	87,096	694	397	1,091	88,187
11.0 - 12.9	79,661	5,229	84,890	175	118	293	85,183
13.0 - 14.9	66,748	3,658	70,406	--	150	150	70,556
15.0 - 16.9	50,026	3,152	53,178	--	73	73	53,251
17.0 - 18.9	36,217	2,312	38,529	--	207	207	38,736
19.0 - 20.9	20,299	1,417	21,716	--	53	53	21,769
21.0 - 22.9	10,114	870	10,984	--	137	137	11,121
23.0 - 24.9	5,178	315	5,493	--	59	59	5,552
25.0 - 26.9	2,552	236	2,788	--	88	88	2,876
27.0 - 28.9	594	80	674	--	--	--	674
29.0+	751	--	751	--	170	170	921
Total	451,834	30,774	482,608	5,104	3,512	8,616	491,224

Table 6 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand cubic feet						
Pennington							
5.0 - 6.9	46,578	1,886	48,464	1,230	349	1,579	50,043
7.0 - 8.9	85,439	2,712	88,151	618	283	901	89,052
9.0 - 10.9	101,920	2,999	104,919	352	192	544	105,463
11.0 - 12.9	99,076	2,861	101,937	101	91	192	102,129
13.0 - 14.9	80,431	2,712	83,143	--	26	26	83,169
15.0 - 16.9	60,249	2,473	62,722	--	40	40	62,762
17.0 - 18.9	41,149	1,493	42,642	--	85	85	42,727
19.0 - 20.9	26,412	1,116	27,528	--	72	72	27,600
21.0 - 22.9	13,234	672	13,906	--	75	75	13,981
23.0 - 24.9	6,394	308	6,702	--	--	--	6,702
25.0 - 26.9	3,678	--	3,678	--	48	48	3,726
27.0 - 28.9	835	--	835	--	--	--	835
29.0+	526	--	526	--	94	94	620
Total	565,921	19,232	585,153	2,301	1,355	3,656	588,809

Table 6 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand cubic feet						
All counties							
5.0 - 6.9	126,434	6,801	133,235	4,576	2,355	6,931	140,166
7.0 - 8.9	232,761	9,165	241,926	2,276	1,448	3,724	245,650
9.0 - 10.9	281,939	10,029	291,968	1,247	874	2,121	294,089
11.0 - 12.9	271,077	9,486	280,563	282	467	749	281,312
13.0 - 14.9	226,645	7,945	234,590	--	293	293	234,883
15.0 - 16.9	169,573	7,009	176,582	--	146	146	176,728
17.0 - 18.9	116,503	4,555	121,058	--	411	411	121,469
19.0 - 20.9	73,217	3,214	76,431	--	177	177	76,608
21.0 - 22.9	36,054	2,137	38,191	--	339	339	38,530
23.0 - 24.9	17,521	874	18,395	--	156	156	18,551
25.0 - 26.9	9,623	236	9,859	--	380	380	10,239
27.0 - 28.9	2,180	80	2,260	--	--	--	2,260
29.0+	1,711	--	1,711	--	864	864	2,575
Total	1,565,238	61,531	1,626,769	8,381	7,910	16,291	1,643,060

Table 7.--*Net volume of sawtimber on commercial timberland by county, diameter class, and species; western South Dakota, 1977*

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand board feet, International 1/4-inch rule						
Butte, Harding, Meade							
9.0 - 10.9	41,237	1,011	42,248	0	0	0	42,248
11.0 - 12.9	54,389	733	55,122	13	962	975	56,097
13.0 - 14.9	56,377	817	57,194	--	527	527	57,721
15.0 - 16.9	38,374	477	38,851	--	155	155	39,006
17.0 - 18.9	23,563	420	23,983	--	566	566	24,549
19.0 - 20.9	14,430	260	14,690	--	244	244	14,934
21.0 - 22.9	4,826	250	5,076	--	603	603	5,679
23.0 - 24.9	2,985	59	3,044	--	477	477	3,521
25.0 - 26.9	1,546	--	1,546	--	1,041	1,041	2,587
27.0 - 28.9	199	--	199	--	--	--	199
29.0+	139	--	139	--	3,140	3,140	3,279
Total	238,065	4,027	242,092	13	7,715	7,728	249,820

Table 7 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand board feet, International 1/4-inch rule						
Custer							
9.0 - 10.9	181,160	9,208	190,368	0	0	0	190,368
11.0 - 12.9	290,656	6,927	297,583	18	275	293	297,876
13.0 - 14.9	298,373	8,229	306,602	--	54	54	306,656
15.0 - 16.9	255,308	7,405	262,713	--	14	14	262,727
17.0 - 18.9	184,986	3,964	188,950	--	40	40	188,990
19.0 - 20.9	134,845	3,726	138,571	--	10	10	138,581
21.0 - 22.9	62,576	3,167	65,743	--	24	24	65,767
23.0 - 24.9	28,960	1,470	30,430	--	--	--	30,430
25.0 - 26.9	17,242	--	17,242	--	17	17	17,259
27.0 - 28.9	3,721	--	3,721	--	--	--	3,721
29.0+	2,196	--	2,196	--	34	34	2,230
Total	1,460,023	44,096	1,504,119	18	468	486	1,504,605

Table 7 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand board feet, International 1/4-inch rule						
Fall River							
9.0 - 10.9	18,378	583	18,961	0	0	0	18,961
11.0 - 12.9	25,890	442	26,332	--	7	7	26,339
13.0 - 14.9	28,359	284	28,643	--	2	2	28,645
15.0 - 16.9	21,312	384	21,696	--	--	--	21,696
17.0 - 18.9	13,405	118	13,523	--	--	--	13,523
19.0 - 20.9	7,391	121	7,512	--	--	--	7,512
21.0 - 22.9	3,015	235	3,250	--	--	--	3,250
23.0 - 24.9	1,711	57	1,768	--	--	--	1,768
25.0 - 26.9	520	--	520	--	197	197	717
27.0 - 28.9	451	--	451	--	--	--	451
29.0+	349	--	349	--	--	--	349
Total	120,781	2,224	123,005	--	206	206	123,211

Table 7 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand board feet, International 1/4-inch rule						
Lawrence							
9.0 - 10.9	217,980	25,455	243,435	0	0	0	243,435
11.0 - 12.9	340,262	29,223	369,485	922	577	1,499	370,984
13.0 - 14.9	331,486	20,612	352,098	--	766	766	352,864
15.0 - 16.9	272,078	18,210	290,288	--	395	395	290,683
17.0 - 18.9	210,598	13,040	223,638	--	1,128	1,128	224,766
19.0 - 20.9	122,182	8,045	130,227	--	293	293	130,520
21.0 - 22.9	56,878	5,009	61,887	--	700	700	62,587
23.0 - 24.9	29,725	1,928	31,653	--	317	317	31,970
25.0 - 26.9	14,443	1,294	15,737	--	468	468	16,205
27.0 - 28.9	3,456	451	3,907	--	--	--	3,907
29.0+	4,581	--	4,581	--	982	982	5,563
Total	1,603,669	123,267	1,726,936	922	5,626	6,548	1,733,484

Table 7 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand board feet, International 1/4-inch rule						
Pennington							
9.0 - 10.9	262,438	16,786	279,224	0	0	0	279,224
11.0 - 12.9	409,348	16,475	425,823	506	475	981	426,804
13.0 - 14.9	389,852	15,895	405,747	--	137	137	405,884
15.0 - 16.9	322,885	14,650	337,535	--	217	217	337,752
17.0 - 18.9	235,691	8,910	244,601	--	471	471	245,072
19.0 - 20.9	157,717	6,642	164,359	--	385	385	164,744
21.0 - 22.9	72,911	4,141	77,052	--	384	384	77,436
23.0 - 24.9	35,849	1,945	37,794	--	--	--	37,794
25.0 - 26.9	20,770	--	20,770	--	258	258	21,028
27.0 - 28.9	4,799	--	4,799	--	--	--	4,799
29.0+	3,071	--	3,071	--	540	540	3,611
Total	1,915,331	85,444	2,000,775	506	2,867	3,373	2,004,148

Table 7 (con.)

County and diameter class (inches)	SOFTWOODS			HARDWOODS			Total all species
	Ponderosa pine	White spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand board feet, International 1/4-inch rule						
All counties							
9.0 - 10.9	721,193	53,043	774,236	0	0	0	774,236
11.0 - 12.9	1,120,545	53,800	1,174,345	1,459	2,296	3,755	1,178,100
13.0 - 14.9	1,104,447	45,837	1,150,284	--	1,486	1,486	1,151,770
15.0 - 16.9	909,957	41,126	951,083	--	781	781	951,864
17.0 - 18.9	668,243	26,452	694,695	--	2,205	2,205	696,900
19.0 - 20.9	436,565	18,794	455,359	--	932	932	456,291
21.0 - 22.9	200,206	12,802	213,008	--	1,711	1,711	214,719
23.0 - 24.9	99,230	5,459	104,689	--	794	794	105,483
25.0 - 26.9	54,521	1,294	55,815	--	1,981	1,981	57,796
27.0 - 28.9	12,626	451	13,077	--	--	--	13,077
29.0+	10,336	--	10,336	--	4,696	4,696	15,032
Total	5,337,869	259,058	5,596,927	1,459	16,882	18,341	5,615,268

Table 8.--Net annual growth of growing stock and sawtimber on commercial timberland by county, softwoods and hardwoods, all owner group; western South Dakota, 1977

County	All owner groups	National Forest	Other public	Forest industry	Other private	All owner groups	National Forest	Other public	Forest industry	Other private
	Thousand cubic feet					Thousand board feet[1]				
Butte, Harding, Meade										
Softwoods	2,509	1,312	191	--	1,006	9,853	5,211	714	--	3,928
Hardwoods	102	20	13	--	69	116	11	9	--	96
All species	2,611	1,332	204	--	1,075	9,969	5,222	723	--	4,024
Custer										
Softwoods	10,067	8,063	1,142	--	862	40,531	33,988	3,850	--	2,693
Hardwoods	125	96	2	--	27	188	185	(2)	--	3
All species	10,192	8,159	1,144	--	889	40,719	34,173	3,850	--	2,696
Fall River										
Softwoods	1,190	603	58	--	529	4,130	2,429	174	--	1,527
Hardwoods	5	4	(2)	--	1	9	7	(2)	--	2
All species	1,195	607	58	--	530	4,139	2,436	174	--	1,529
Lawrence										
Softwoods	11,408	8,422	389	--	2,597	54,704	39,689	1,943	--	13,072
Hardwoods	670	314	50	--	306	555	179	59	--	317
All species	12,078	8,736	439	--	2,903	55,259	39,867	2,002	--	13,389
Pennington										
Softwoods	13,530	12,068	90	--	1,377	58,400	53,061	296	--	5,043
Hardwoods	353	242	9	--	102	395	233	9	--	153
All species	13,883	12,305	99	--	1,479	58,795	53,294	305	--	5,196
All counties										
Softwoods	38,704	30,468	1,870	--	6,371	167,618	134,378	6,971	--	26,269
Hardwoods	1,255	676	74	--	505	1,263	614	77	--	572
All species	39,959	31,139	1,944	--	6,876	168,881	134,992	7,048	--	26,841

[1]International 1/4-inch rule.

[2]Less than 0.5 thousand bd. ft.

[3]Less than 0.5 thousand ft^3.

Table 9.--*Annual mortality of growing stock and sawtimber on commercial timberland by county, softwoods and hardwoods, and owner group; western South Dakota, 1977*

County	All owner groups	National Forest	Other public	Forest industry	Other private	All owner groups	National Forest	Other public	Forest industry	Other private
	Thousand cubic feet					*Thousand board feet*[1]				
Butte, Harding, Meade										
Softwoods	164	138	2	--	24	659	569	7	--	83
Hardwoods	5	--	([2])	--	5	26	--	1	--	25
All species	169	138	--	--	29	685	569	8	--	108
Custer										
Softwoods	1,063	950	104	--	9	4,669	4,154	486	--	29
Hardwoods	--	--	--	--	--	--	--	--	--	--
All species	1,063	950	104	--	9	4,669	4,154	486	--	29
Fall River										
Softwoods	52	39	1	--	12	221	162	6	--	53
Hardwoods	--	--	--	--	--	--	--	--	--	--
All species	52	39	1	--	12	221	162	6	--	53
Lawrence										
Softwoods	1,089	962	15	--	112	4,872	4,350	59	--	463
Hardwoods	4	--	1	--	3	--	--	--	--	--
All species	1,093	962	16	--	115	4,872	4,350	59	--	463
Pennington										
Softwoods	1,414	1,402	1	--	11	6,198	6,183	([3])	--	15
Hardwoods	--	--	--	--	--	-	--	--	--	--
All species	1,414	1,402	1	--	11	6,198	6,183	([3])	--	15
All counties										
Softwoods	3,782	3,491	123	--	168	16,619	15,418	558	--	643
Hardwoods	9	--	1	--	8	26	--	1	--	25
All species	3,791	3,491	124	--	176	16,645	15,418	559	--	668

[1]International 1/4-inch rule.

[2]Less than 0.5 thousand ft^3.

[3]Less than 0.5 thousand bd. ft.

Table 10.--*Projected output of roundwood projects from timberlands by county, softwoods and hardwoods, and owner group; western South Dakota, 1977*

County	All owner groups	National Forest	Other public	Forest industry	Other private
			Thousand cubic feet		
Butte, Harding, Meade					
Softwoods	1,076	672	1	--	403
Hardwoods	--	--	--	--	--
All species	1,076	672	1	--	403
Custer					
Softwoods	3,451	2,982	85	--	384
Hardwoods	--	--	--	--	--
All species	3,451	2,982	85	--	384
Fall River					
Softwoods	--	--	--	--	--
Hardwoods	--	--	--	--	--
All species	--	--	--	--	--
Lawrence					
Softwoods	10,329	7,085	81	--	3,163
Hardwoods	--	--	--	--	--
All species	10,329	7,085	81	--	3,163
Pennington					
Softwoods	4,800	3,922	49	--	829
Hardwoods	--	--	--	--	--
All species	4,800	3,922	49	--	829
All counties					
Softwoods	19,656	14,661	216	--	4,779
Hardwoods	--	--	--	--	--
All species	19,656	14,661	216	--	4,779

Table 11.--*Projected removals from growing stock and sawtimber on commercial timberland by county, roundwood products, logging residues, and other removals; western South Dakota, 1977*

County	Total removals	All products	Sawlogs	Veneer logs	Pulpwood	Commercial poles	Mine timbers	Miscellaneous industrial wood	Posts, fuelwood, miscellaneous farm timbers	Logging residues	Other removals
	Thousand cubic feet										
Butte, Harding, Meade	1,113	1,055	714	--	259	9	--	--	73	45	13
Custer	3,578	3,403	2,289	--	455	156	--	--	503	133	42
Fall River	--	--	--	--	--	--	--	--	--	--	--
Lawrence	10,754	10,204	6,588	--	2,518	278	--	--	820	423	127
Pennington	4,965	4,707	3,394	--	868	116	--	--	329	200	58
All counties	20,410	19,369	12,985	--	4,100	559	--	--	1,725	801	240
	Thousand board feet, International 1/4-inch rule										
Butte, Harding, Meade	6,451	6,315	4,511	--	1,475	45	--	--	284	58	78
Custer	20,154	19,738	14,470	--	2,583	727	--	--	1,958	172	244
Fall River	--	--	--	--	--	--	--	--	--	--	--
Lawrence	61,746	60,456	41,655	--	14,315	1,294	--	--	3,192	542	748
Pennington	28,822	28,215	21,457	--	4,935	542	--	--	1,281	258	349
All counties	117,173	114,724	82,093	--	23,308	2,608	--	--	6,715	1,030	1,419

Green, Alan W.
1978. Timber resources of western South Dakota. USDA For. Serv. Resour. Bull. INT-12, 56 p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

Reports findings of the comprehensive survey of western South Dakota's 1.4 million acres of forests, which include 1.2 million acres of commercial forest land. Presents statistics on area, volume, growth, mortality, and timber use. Also describes species, volumes per acre, stocking, site quality, ownership, trends in product harvesting and other factors that bear on timber management. Opportunities and problems related to future development are discussed.

KEYWORDS: timber supplies, forest land, statistics.

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FOREST AREA AND TIMBER RESOURCE STATISTICS FOR SOUTHWESTERN UTAH, 1975

MICHAEL K. BARRETT
and
DOROTHY G. SHUPE

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Michael K. Barrett and Dorothy G. Shupe

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
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RESEARCH SUMMARY

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

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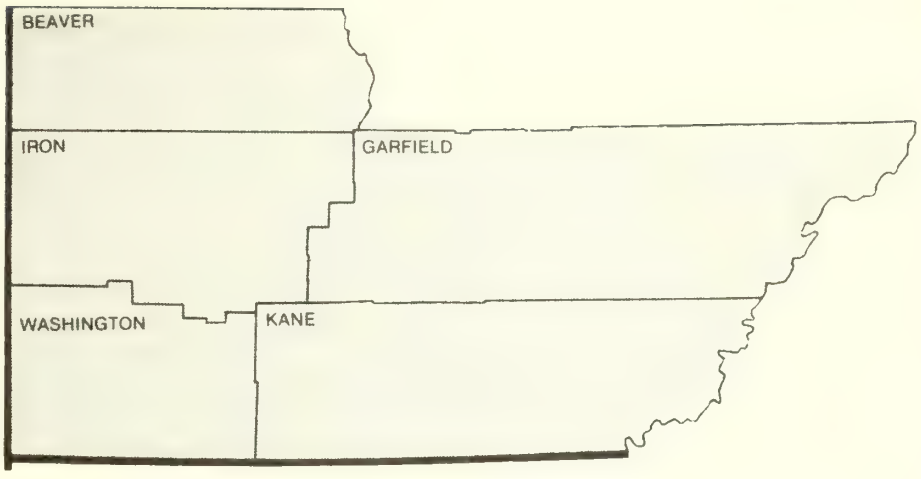
SOUTHWESTERN UTAH



INTRODUCTION

A comprehensive timber resource study was conducted on public and private lands, except National Forest land, in southwestern Utah in 1975 by the Utah Department of Natural Resources, Division of State Lands and Forestry, in cooperation with the Division of State and Private Forestry, Forest Service, Region 4, and the Intermountain Forest and Range Experiment Station.

Southwestern Utah is comprised of Beaver, Garfield, Iron, Kane, and Washington Counties (fig. 1). The total land area is 11.1 million acres (4.5 million hectares). The largest share of this land is Federally owned. The Bureau of Land Management manages 5.9 million acres (2.4 million hectares) and the Forest Service, 1.9 million acres (0.8 million hectares). The remaining area is owned by the State, 0.8 million acres (0.3 million hectares); by other public owners, 0.9 million acres (0.4 million hectares); and by private owners, 1.6 million acres (0.6 million hectares). The data presented here are for public and private lands, BUT EXCLUDE NATIONAL FOREST OWNERSHIP.

Highlights show the area of commercial timberland in comparison to total forest land area, and the distribution of this area by forest type, stand-size class, and site class. Discussions of data reliability and terminology are included. These two items should be reviewed carefully when using this information.

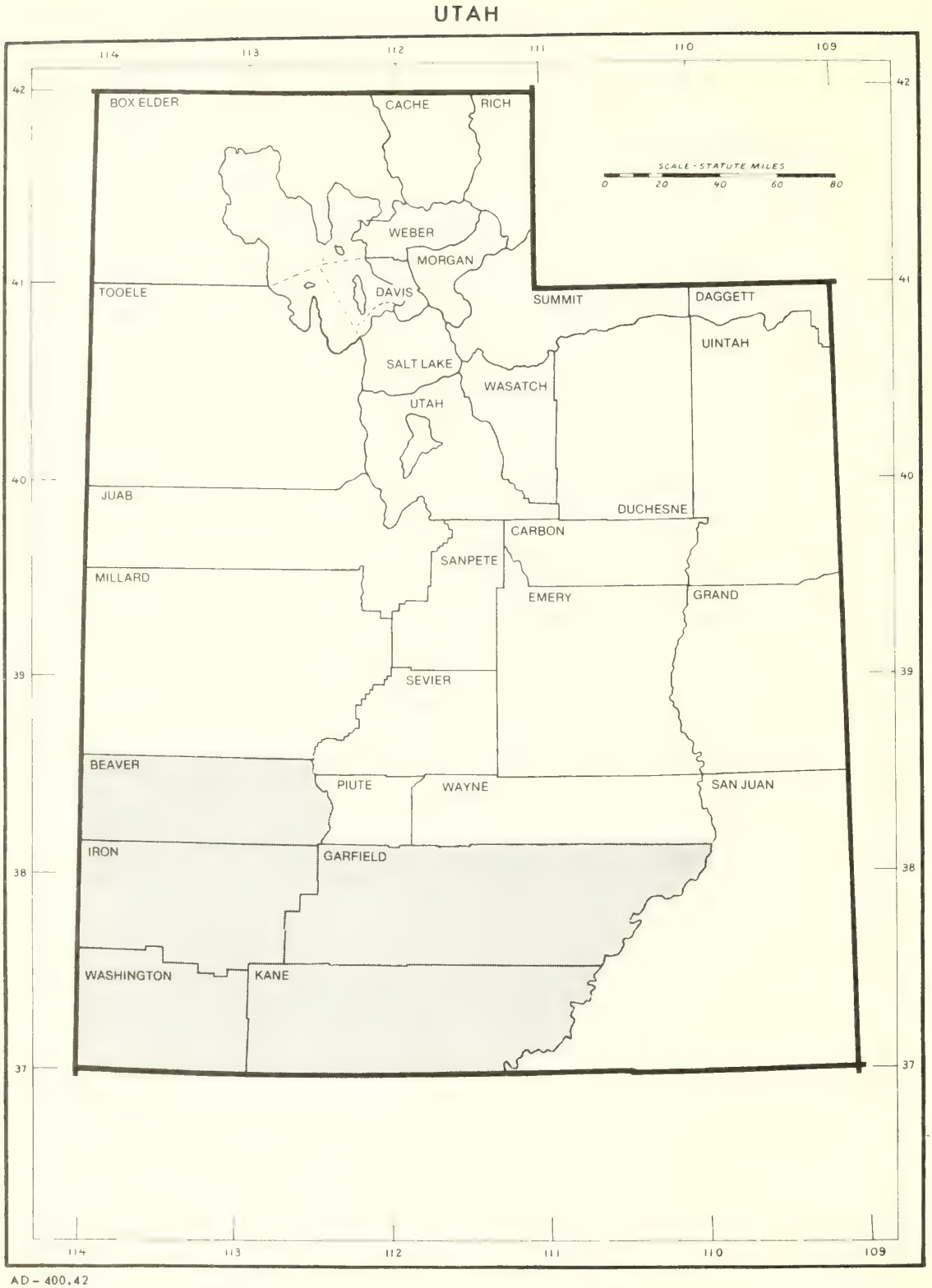


Figure 1.--Southwestern Utah Counties, Beaver, Garfield, Iron, Kane, and Washington.

HIGHLIGHTS

Area

- The forest land area is 3.8 million acres (1.5 million hectares), or 41 percent of the total public and private land area.

- Of the forest land, 100 thousand acres (40 thousand hectares), or about 3 percent, is classified as commercial timberland.

- Public ownership accounts for 54 thousand acres (22 thousand hectares), or 54 percent of the commercial timberland.

- Aspen forest type occupies 23 percent of the commercial timberland. Of this, 86 percent is privately owned.

- The predominant softwood forest type is ponderosa pine, which occupies 46 percent of the commercial timberland. The remaining area consists of spruce-subalpine fir, Douglas-fir, and white fir forest types.

- About 82 percent of the commercial timberland is sawtimber stands; poletimber stands occupy 13 percent. The remaining 5 percent is in sapling and seedling stands or nonstocked.

- Over 51 percent of the sawtimber stands is in public ownership.

- Fifty-eight percent of the commercial timberland is in the 20 to 49 cubic-foot productivity class.

Inventory

- Growing stock volume is 131 million cubic feet (4 million cubic meters) with 63 percent in softwood sawtimber trees.

- Rough, rotten, and salvable dead trees comprise 8 million cubic feet (0.2 million cubic meters), or 6 percent, of the total sound wood volume.

- About 74 percent of the 550 million board feet[1] of sawtimber volume is in sawtimber trees less than 23.0 inches d.b.h.

- Ponderosa pine and aspen make up 61 percent of both the total growing stock volume and the total sawtimber volume. Species sharing the remaining percentage are Engelmann spruce, subalpine fir, white fir, Douglas-fir, pinyon/juniper,[2] limber pine, and cottonwood.

- Private owners control 61 percent of the growing stock volume and 54 percent of the sawtimber volume.

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[1]International 1/4-inch rule.

[2]Although pinyon/juniper usually occurs on unproductive forest land, when it occurs in mixtures with other species on productive sites, it is reported in the commercial timberland statistics.

Growth and Mortality

- Net annual growth of growing stock totals 2,629 thousand cubic feet (74 thousand cubic meters) with 40 percent occurring in aspen species. Growth and mortality are not measured for pinyon and juniper trees.
- About 68 percent of the total net growth is on private lands.
- The annual mortality of 344 thousand cubic feet (10 thousand cubic meters) offsets 12 percent of the gross annual growth.
- Over 28 percent of the mortality occurs in the subalpine fir species.

DATA RELIABILITY

The sampling errors presented in tables 1 and 2 are in terms of one standard error--the 67 percent confidence level. Individual cells within tables should be used with caution. Some are based on small sample sizes, thus resulting in high sampling errors.

Table 1.--*Forest land area and associated sampling error percentages for Southwestern Utah, 1975*

Item	Softwood types		Hardwood types		All types	
	Acres	Percent	Acres	Percent	Acres	Percent
Commercial timberland	76,960	14.0	22,829	21.3	99,789	11.2
Productive reserved	22,929	14.0	701	73.8	23,630	13.6
Other forest land:						
Unproductive reserved	187,929	2.7	30,381	6.8	218,310	2.4
Unproductive nonreserved	3,105,604	.5	327,704	2.7	3,433,308	.5

Table 2.--*Net volume, net annual growth, and annual mortality on commercial timberland, with associated sampling error percentages for Southwestern Utah, 1975*

Item	Softwoods		Hardwoods		All species	
	Volume	Percent	Volume	Percent	Volume	Percent
Net volume:						
Growing stock (M cubic feet)	89,533	16.8	41,512	22.5	131,045	13.3
Sawtimber (M board feet[1])	437,406	17.5	112,931	27.7	550,337	15.0
Net annual growth:						
Growing stock (cubic feet)	1,565,709	18.6	1,063,395	21.4	2,629,104	13.5
Sawtimber (board feet[1])	8,969,088	20.0	7,871,551	31.5	16,840,639	17.4
Annual mortality:						
Growing stock (cubic feet)	316,095	33.6	27,445	73.8	343,540	32.1
Sawtimber (board feet[1])	1,228,474	34.4	--	0	1,228,474	34.4

[1]International 1/4-inch rule.

TERMINOLOGY AND DATA TABLES

The following terminology section contains definitions, taken directly from the Forest Service Forest Survey Handbook, that are relevant to the timber resource data presented in this resource bulletin. Forest area and timber resource data for southwestern Utah are displayed in tables 3 through 23.

TERMINOLOGY

Land

Bureau of the Census.--The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds less than 40 acres in area.

Water

Census water.--As defined by the Bureau of the Census: streams, sloughs, estuaries, and canals more than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds more than 40 acres in area.

Noncensus water.--The same as defined by the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Land Use Classes

Forest land.--Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Commercial timberland.--Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Productive-reserved forest land.--Forest land sufficiently productive to qualify as commercial timberland, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Other forest land.--(1) Forest land incapable of producing 20 cubic feet per acre of industrial wood under management, because of adverse site conditions; (2) unproductive-reserved forest land.

Nonforest land.--Land that has never supported forests and lands formerly forested where use for timber management is precluded by development for other uses.

Public Ownership Classes

National Forest land.--Federal lands legally designated as National Forest or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands.--Federal lands administered by the Bureau of Land Management.

Indian lands.--Tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

Miscellaneous Federal lands.--Federal lands other than the following: (1) National Forest lands; (2) lands administered by the Bureau of Land Management; and (3) Indian lands.

State.--Lands owned by States, or lands leased to these governmental units for 50 years or more.

County and municipal lands.--Lands owned by counties and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Private Ownership Classes

Forest industry lands.--Lands owned by companies or individuals operating wood-using plants.

Farmer-owned lands.--Lands owned by farm operators. (Note: These exclude lands leased by farm operators from nonfarm owners, such as railroad companies and States.)

Miscellaneous private lands.--Privately owned lands other than forest industry and farmer-owned lands.

Forest Type and Tree Species

Forest types.--A classification of forest land based upon the species forming a plurality of live-tree stocking.

Forest trees.--Woody plants having a well-developed stem and usually more than 12 feet in height at maturity.

Commercial species.--Tree species presently or prospectively suitable for industrial wood products.

Softwoods.--Coniferous trees, usually evergreen, having needles or scalelike leaves.

Hardwoods.--Dicotyledonous trees, usually broad-leaved and deciduous.

Area Condition Classes

Stocking.--Stocking is an effort to express the extent to which growing space is effectively utilized by present or potential growing stock trees of commercial species. "Percent of stocking" is synonymous with "percentage of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

"Stocking percentages" express current area occupancy in relation to specified standards for full stocking based on number, size, and spacing of trees considered necessary to fully utilize the forest land.

Full utilization of the site is assumed to occur over a range of basal area. As an interim guide, 60 percent of the normal yield table values has been used to establish the lower limit of this range which represents full-site occupancy. This is called 100-percent stocking. The upper limit of full stocking has been set at 132 percent. Sites with less than 100-percent stocking represent understocking with less than full-site occupany. Overstocking is characterized by sites with over 133 percent stocking.

Class 10.--Area fully stocked (100-132 percent) with desirable trees and not overstocked (133 percent or more).

Class 20.--Area fully stocked with desirable trees, but overstocked with all live trees.

Class 30.--Areas medium to fully stocked (60-99 percent) with desirable trees and with less than 30 percent of the area controlled by other trees and (or) inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

Class 40.--Areas medium to fully stocked with desirable trees and with 30 percent or more of the area controlled by other trees and (or) conditions that ordinarily prevent occupancy by desirable trees.

Class 50.--Areas poorly stocked (16.7-59 percent) with desirable trees, but fully stocked with growing stock trees.

Class 60.--Areas poorly stocked with desirable trees, but with medium to full stocking of growing stock trees.

Class 70.--Areas nonstocked (less than 16.7 percent) or poorly stocked with desirable trees, and poorly stocked with growing stock trees.

Class 80.--Low-risk old-growth stands.

Class 90.--High-risk old-growth stands.

Nonstocked.--Areas less than 16.7 percent stocked with growing stock trees.

Class of Timber

Growing stock trees.--Live trees of commercial species qualifying as desirable or acceptable trees. (Note: Excludes rough, rotten, and dead trees.)

Desirable trees.--Growing stock trees (a) having no serious defect in quality limiting present or prospective use for timber products; (b) of relatively high vigor; and (c) containing no pathogens that may result in death or serious deterioration before rotation age.

Acceptable trees.--Growing stock trees that meet specified standards of size and quality, but not qualifying as desirable trees.

Rough trees.--(1) Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of roughness or poor form; (2) all live trees of non-commercial species.

Rotten trees.--Live trees that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume (cubic-foot basis) in a tree is rotten.

Cull.--Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Salvable dead trees.--Standing or down dead trees that are considered merchantable by Rocky Mountain Regional standards.

Mortality trees.--Trees formerly growing stock dying from natural causes during a specified period, usually 1 year.

Saw log portion.--That part of the bole of sawtimber trees between the stump and the saw log top. A 1-foot stump is used.

Upper-stem portion.--That part of the bole of sawtimber trees above the saw log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs, whichever occurs first.

Tree Size Classes

Seedlings.--Live trees less than 1.0 inch in diameter at breast height.

Saplings.--Trees 1.0-4.9 inches in diameter at breast height.

Poletimber trees.--Trees at least 5.0 inches in d.b.h., but smaller than sawtimber size.

Sawtimber trees.--Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches, and 11.0 inches for hardwoods.

Volume

Net volume.--Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Growing stock volume.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

Sawtimber volume.--Net volume in board feet of sawtimber trees of commercial species. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

Growth and Mortality

Net annual growth.--The increase in net growing stock volume of a specified size class for a specific year. (Note: Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus net volume of trees reaching the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten trees during the year.)

Mortality.--Number or sound-wood volume of growing stock trees dying from natural causes during a specified period.

Site

Site class.--A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean net annual growth of growing stock (not including thinnings or mortality loss) attainable at culmination of mean net annual growth over age. Height-age relationships are usually used as indicators of the specified volume-site class.

Stand-Size Classes

Sawtimber stands.--Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.--Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and (or) sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.--Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and (or) seedlings.

Nonstocked land.--Commercial timberland less than 16.7 percent stocked with growing stock trees.

Table 3.--*Total area in Southwestern Utah by ownership class, 1975*

Ownership class	Acres	Hectares
National Forest	1,946,800	787,845
Bureau of Land Management	5,848,077	2,366,643
Miscellaneous Federal	923,840	373,866
State	828,651	335,345
County and municipal	2,472	1,000
Private	1,569,008	634,958
Total land area	11,118,848	4,499,657
Census water	181,504	73,452
Gross area[1]	11,300,352	4,573,109

[1]U.S. Bureau of the Census, land and water area of the United States, 1970.

Table 4.--*Land area in Southwestern Utah by major land class and ownership class, 1975*

Land class	Ownership class			
	Public		Private	
	Acres	Hectares	Acres	Hectares
Commercial timberland	45,743	18,511	54,046	21,872
Productive reserved	22,482	9,098	1,148	464
Other forest land:				
Unproductive reserved	214,324	86,734	3,986	1,613
Unproductive nonreserved	3,087,449	1,249,452	345,859	139,965
Total forest land	3,369,998	1,363,795	405,039	163,914
Nonforest land	4,233,042	1,713,059	1,163,969	471,044
Total land area	7,603,040	3,076,854	1,569,008	634,958

Table 5.--*Area of commercial timberland in Southwestern Utah by forest type, stand-size class, and site class, public owned, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
				Acres		
Douglas-fir:						
Sawtimber	--	--	--	3,999	707	4,706
Poletimber	--	--	--	--	477	477
Sapling and seedling	--	--	--	729	--	729
Nonstocked	--	--	--	--	--	--
Total	--	--	--	4,728	1,184	5,912
Ponderosa pine:						
Sawtimber	--	--	--	6,350	23,752	30,102
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	728	728
Total	--	--	--	6,350	24,480	30,830
Spruce-subalpine fir:						
Sawtimber	--	--	--	3,591	833	4,424
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	3,591	833	4,424
White fir:						
Sawtimber	--	--	--	283	699	982
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	482	--	482
Nonstocked	--	--	--	--	--	--
Total	--	--	--	765	699	1,464
Aspen:						
Sawtimber	--	--	--	1,273	597	1,870
Poletimber	--	--	157	157	929	1,243
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	157	1,430	1,526	3,113
All types:						
Sawtimber	--	--	--	15,496	26,588	42,084
Poletimber	--	--	157	157	1,406	1,720
Sapling and seedling	--	--	--	1,211	--	1,211
Nonstocked	--	--	--	--	728	728
Total	--	--	157	16,864	28,722	45,743

Table 6.--*Area of commercial timberland in Southwestern Utah by forest type, stand-size class, and site class, private owned, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
				Acres		
Douglas-fir:						
Sawtimber	--	--	--	1,705	904	2,609
Poletimber	--	--	--	--	398	398
Sapling and seedling	--	--	--	874	--	874
Nonstocked	--	--	--	--	--	--
Total	--	--	--	2,579	1,302	3,881
Ponderosa pine:						
Sawtimber	--	--	--	2,806	11,592	14,398
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	874	874
Total	--	--	--	2,806	12,466	15,272
Spruce-subalpine fir:						
Sawtimber	--	--	--	8,425	569	8,994
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	8,425	569	8,994
White fir:						
Sawtimber	--	--	--	1,682	3,112	4,794
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	1,389	--	1,389
Nonstocked	--	--	--	--	--	--
Total	--	--	--	3,071	3,112	6,183
Aspen:						
Sawtimber	--	--	--	4,747	4,643	9,390
Poletimber	--	--	1,480	1,481	7,365	10,326
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	1,480	6,228	12,008	19,716
All types:						
Sawtimber	--	--	--	19,365	20,820	40,185
Poletimber	--	--	1,480	1,481	7,763	10,724
Sapling and seedling	--	--	--	2,263	--	2,263
Nonstocked	--	--	--	--	874	874
Total	--	--	1,480	23,109	29,457	54,046

Table 7.--*Area of commercial timberland in Southwestern Utah by forest type, stand-size class, and site class, summary--public and private, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
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Douglas-fir:						
Sawtimber	--	--	--	5,704	1,611	7,315
Poletimber	--	--	--	--	875	875
Sapling and seedling	--	--	--	1,603	--	1,603
Nonstocked	--	--	--	--	--	--
Total	--	--	--	7,307	2,486	9,793
Ponderosa pine:						
Sawtimber	--	--	--	9,156	35,344	44,500
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	1,602	1,602
Total	--	--	--	9,156	36,946	46,102
Spruce-subalpine fir:						
Sawtimber	--	--	--	12,016	1,402	13,418
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	12,016	1,402	13,418
White fir:						
Sawtimber	--	--	--	1,965	3,811	5,776
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	1,871	--	1,871
Nonstocked	--	--	--	--	--	--
Total	--	--	--	3,836	3,811	7,647
Aspen:						
Sawtimber	--	--	--	6,020	5,240	11,260
Poletimber	--	--	1,637	1,638	8,294	11,569
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	1,637	7,658	13,534	22,829
All types:						
Sawtimber	--	--	--	34,861	47,408	82,269
Poletimber	--	--	1,637	1,638	9,169	12,444
Sapling and seedling	--	--	--	3,474	--	3,474
Nonstocked	--	--	--	--	1,602	1,602
Total	--	--	1,637	39,973	58,179	99,789

Table 8.--*Area of commercial timberland in Southwestern Utah by stand volume and ownership classes, 1975*

Stand volume per acre[1]	Ownership class		
	Public	Private	Public and private
	Acres		
Less than 1,500 board feet	2,718	5,050	7,768
1,500 to 4,999 board feet	21,240	25,254	46,494
5,000 to 9,999 board feet	15,316	16,180	31,496
10,000 board feet or more	6,469	7,562	14,031
All classes	45,743	54,046	99,789

[1]International 1/4-inch rule.

Table 9.--*Area of commercial timberland in Southwestern Utah by forest type and area condition class; public and private, 1975*

Forest type	Area condition class									Nonstocked	All classes	
	10	20	30	40	50	60	70	80	90			
	Acres											*Hectares*
Douglas-fir	--	--	--	--	526	--	7,130	526	1,611	--	9,793	3,963
Ponderosa pine	--	--	--	1,602	--	3,777	14,553	3,777	20,791	1,602	46,102	18,657
Spruce-subalpine fir	--	1,965	2,163	--	1,961	2,722	876	526	3,205	--	13,418	5,430
White fir	--	--	1,965	--	1,964	--	1,871	--	1,847	--	7,647	3,095
Aspen	--	--	2,727	--	3,275	9,075	7,752	--	--	--	22,829	9,238
All types	--	1,965	6,855	1,602	7,726	15,574	32,182	4,829	27,454	1,602	99,789	40,383

Table 10.--*Area of productive reserved and other forest land in Southwestern Utah by land class, ownership class, and forest type, 1975*

Land class	Forest type							All types	
	Douglas-fir	Ponderosa pine	Spruce-subalpine fir	White fir	Pinyon-juniper	Aspen	Mixed hardwoods		
	Acres								*Hectares*
Productive reserved area:									
Public	4,208	13,833	3,552	198	--	691	--	22,482	9,098
Private	115	987	27	9	--	10	--	1,148	464
Other forest land area:									
Unproductive nonreserved:									
Public	477	4,022	--	--	2,921,410	4,043	157,497	3,087,449	1,249,452
Private	398	3,228	--	--	176,069	23,675	142,489	345,859	139,965
Unproductive reserved:									
Public	482	1,662	--	--	184,162	869	27,149	214,324	86,734
Private	--	125	--	--	1,498	19	2,344	3,986	1,613
Total all areas:									
Public	5,167	19,517	3,552	198	3,105,572	5,603	184,646	3,324,255	1,345,284
Private	513	4,340	27	9	177,567	23,704	144,833	350,993	142,042
Total acres	5,680	23,857	3,579	207	3,283,139	29,307	329,479	3,675,248	--
Total hectares	2,298	9,655	1,448	84	1,328,645	11,860	133,336	--	1,487,326

Table 11.--*Number of growing stock trees on commercial timberland in Southwestern Utah by species and diameter class; public and private, 1975*

Species	Diameter class (inches at breast height)															All classes
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	
	Thousand trees															
Douglas-fir	89	326	55	51	64	102	80	17	42	28	11	12	1	--	6	884
Ponderosa pine	32	355	29	104	146	160	258	144	76	99	51	57	45	14	41	1,611
Limber pine	32	65	--	--	5	23	2	--	--	--	--	--	--	--	--	127
Subalpine fir	1,058	515	494	382	227	121	91	40	24	16	20	6	2	3	--	2,999
White fir	2,389	1,451	718	441	387	146	97	49	23	20	3	10	3	3	2	5,742
Engelmann spruce	163	65	52	62	127	84	69	29	37	16	7	6	7	11	14	749
Pinyon/juniper	--	113	167	5	8	--	15	--	9	--	6	--	--	--	--	323
Total softwoods	3,763	2,890	1,515	1,045	964	636	612	279	211	179	98	91	58	31	63	12,435
Aspen	1,382	1,756	1,707	1,226	790	565	207	115	50	14	5	2	--	--	--	7,819
Cottonwood	--	26	--	--	--	4	--	--	--	--	--	--	--	--	--	30
Total hardwoods	1,382	1,782	1,707	1,226	790	569	207	115	50	14	5	2	--	--	--	7,849
All species	5,145	4,672	3,222	2,271	1,754	1,205	819	394	261	193	103	93	58	31	63	20,284

Table 12.--*Number of cull and salvable dead trees on commercial timberland in Southwestern Utah by ownership class, and softwoods and hardwoods, 1975*

Ownership class and species group	Cull trees			Salvable dead trees
	Sound	Rotten	Total	
	Thousand trees			
Public:				
Softwoods	474	64	538	75
Hardwoods	37	117	154	10
Total	511	181	692	85
Private:				
Softwoods	509	68	577	134
Hardwoods	199	472	671	29
Total	708	540	1,248	163
Public and private:				
Softwoods	983	132	1,115	209
Hardwoods	236	589	825	39
Total	1,219	721	1,940	248

Table 13.--*Net volume of growing stock on commercial timberland in Southwestern Utah by ownership class, forest type, and stand-size class, 1975*

Ownership class	Forest type	Stand-size class				All classes	
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked		
		Thousand cubic feet					*Thousand cubic meters*
Public:							
	Douglas-fir	5,961	364	172	--	6,497	184
	Ponderosa pine	26,621	--	--	122	26,743	757
	Spruce-subalpine fir	10,740	--	--	--	10,740	304
	White fir	2,150	--	--	--	2,150	61
	Aspen	2,865	2,169	--	--	5,034	143
	All types	48,337	2,533	172	122	51,164	1,449
Private:							
	Douglas-fir	3,140	303	206	--	3,649	103
	Ponderosa pine	12,861	--	--	147	13,008	369
	Spruce-subalpine fir	17,797	--	--	--	17,797	504
	White fir	10,289	--	--	--	10,289	291
	Aspen	17,277	17,861	--	--	35,138	995
	All types	61,364	18,164	206	147	79,881	2,262
Public and private:							
	Douglas-fir	9,101	667	378	--	10,146	287
	Ponderosa pine	39,482	--	--	269	39,751	1,126
	Spruce-subalpine fir	28,537	--	--	--	28,537	808
	White fir	12,439	--	--	--	12,439	352
	Aspen	20,142	20,030	--	--	40,172	1,138
	All types	109,701	20,697	378	269	131,045	3,711

Table 14.--*Net volume of sawtimber on commercial timberland in Southwestern Utah by ownership class, forest type, and stand-size class, 1978*

Ownership class	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked	
		Thousand board feet[1]				
Public:						
	Douglas-fir	28,442	792	817	--	30,051
	Ponderosa pine	150,722	--	--	708	151,430
	Spruce-subalpine fir	48,483	--	--	--	48,483
	White fir	7,925	--	--	--	7,925
	Aspen	12,059	4,324	--	--	16,383
	All types	247,631	5,116	817	708	254,272
Private:						
	Douglas-fir	14,834	662	979	--	16,475
	Ponderosa pine	71,239	--	--	849	72,088
	Spruce-subalpine fir	73,797	--	--	--	73,797
	White fir	37,558	--	--	--	37,558
	Aspen	64,317	31,830	--	--	96,147
	All types	261,745	32,492	979	849	296,065
Public and private:						
	Douglas-fir	43,276	1,454	1,796	--	46,526
	Ponderosa pine	221,961	--	--	1,557	223,518
	Spruce-subalpine fir	122,280	--	--	--	122,280
	White fir	45,483	--	--	--	45,483
	Aspen	76,376	36,154	--	--	112,530
	All types	509,376	37,608	1,796	1,557	550,337

[1]International 1/4-inch rule.

Table 15.--*Net volume of growing stock on commercial timberland in Southwestern Utah by species and diameter class; public and private, 1975*

Species	Diameter class (inches at breast height)													
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand cubic feet													
Douglas-fir	193	208	501	1,353	1,700	464	1,511	1,503	715	870	87	--	724	9,829
Ponderosa pine	45	399	1,000	1,979	4,467	3,851	2,960	4,941	2,965	4,568	3,994	1,342	6,524	39,035
Limber pine	--	--	21	281	21	--	--	--	--	--	--	--	--	323
Subalpine fir	628	1,928	2,114	1,751	1,846	1,017	1,029	718	1,191	286	165	413	--	13,086
White fir	931	1,537	2,823	1,715	1,918	1,142	656	811	112	526	226	245	260	12,902
Engelmann spruce	84	272	1,299	1,392	1,603	1,039	1,584	1,017	537	525	819	1,198	2,206	13,575
Pinyon/juniper	78	22	29	--	202	--	167	--	285	--	--	--	--	783
Total softwoods	1,959	4,366	7,787	8,471	11,757	7,513	7,907	8,990	5,805	6,775	5,291	3,198	9,714	89,533
Aspen	3,730	8,046	8,929	9,651	4,791	3,391	1,900	630	253	135	--	--	--	41,456
Cottonwood	--	--	--	56	--	--	--	--	--	--	--	--	--	56
Total hardwoods	3,730	8,046	8,929	9,707	4,791	3,391	1,900	630	253	135	--	--	--	41,512
All species	5,689	12,412	16,716	18,178	16,548	10,904	9,807	9,620	6,058	6,910	5,291	3,198	9,714	131,045

Table 16.--*Net volume of sawtimber on commercial timberland in Southwestern Utah by species and diameter class; public and private, 1975*

Species	Diameter class (inches at breast height)												
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand board feet, International 1/4-inch rule											
Douglas-fir	1,500	5,685	8,275	2,396	8,147	8,386	4,051	4,993	501	--	4,216	48,150
Ponderosa pine	3,774	9,184	23,145	21,117	16,929	28,850	17,555	27,432	24,157	8,157	40,486	220,786
Limber pine	55	1,164	99	--	--	--	--	--	--	--	--	1,318
Subalpine fir	8,882	8,538	9,424	5,243	5,288	3,685	6,151	1,491	872	2,209	--	51,783
White fir	10,742	7,543	8,769	5,188	2,872	3,444	453	2,085	885	959	1,034	43,974
Engelmann spruce	3,557	6,795	8,221	5,394	8,204	5,250	2,778	2,725	4,304	6,342	11,789	67,359
Pinyon/juniper	87	--	1,325	--	1,011	--	1,613	--	--	--	--	4,036
Total softwoods	30,597	38,909	59,258	39,338	42,451	49,615	32,601	38,726	30,719	17,667	57,525	437,406
Aspen	0	50,802	26,726	19,066	10,534	3,431	1,358	709	--	--	--	112,626
Cottonwood	0	305	--	--	--	--	--	--	--	--	--	305
Total hardwoods	0	51,107	26,726	19,066	10,534	3,431	1,358	709	--	--	--	112,931
All species	30,597	90,016	85,984	58,404	52,985	53,046	33,959	39,435	30,719	17,667	57,525	550,337

Table 17.--*Net volume of growing stock and sawtimber on commercial timberland in Southwestern Utah by ownership class and species, 1978*

Ownership class	Species											
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/juniper	Total softwoods	Aspen	Cottonwood	Total hardwoods	All species
	GROWING STOCK *Thousand cubic feet*											
Public	4,704	26,093	143	5,023	2,542	6,429	543	45,477	5,656	31	5,687	51,164
Private	5,125	12,942	180	8,063	10,360	7,146	240	44,056	35,800	25	35,825	79,881
Total	9,829	39,035	323	13,086	12,902	13,575	783	89,533	41,456	56	41,512	131,045
	GROWING STOCK *Thousand cubic meters*											
Public	133	739	4	143	72	182	15	1,288	160	1	161	1,449
Private	145	367	5	228	293	202	7	1,247	1,014	1	1,015	2,262
Total	278	1,106	9	371	365	384	22	2,535	1,174	2	1,176	3,711
	SAWTIMBER *Thousand board feet, International 1/4-inch rule*											
Public	23,104	148,328	575	20,286	8,804	31,872	2,970	235,939	18,167	166	18,333	254,272
Private	25,046	72,458	743	31,497	35,170	35,487	1,066	201,467	94,459	139	94,598	296,065
Total	48,150	220,786	1,318	51,783	43,974	67,359	4,036	437,406	112,626	305	112,931	550,337

Table 18.--*Net volume of timber on commercial timberland in Southwestern Utah by class of timber, and softwoods and hardwoods; public and private, 1975*

Class of timber	Softwoods	Hardwoods	All classes
	Thousand cubic feet		
Sawtimber trees:			
Saw-log portion	80,366	19,768	100,134
Upper-stem portion	2,842	1,039	3,881
Total	83,208	20,807	104,015
Poletimber trees	6,325	20,705	27,030
All growing stock trees	89,533	41,512	131,045
Sound cull trees	725	674	1,399
Rotten cull trees	710	2,569	3,279
Salvable dead trees	3,117	277	3,394
All timber	94,085	45,032	139,117

Table 19.--*Net volume of growing stock on commercial timberland in Southwestern Utah by forest type and species; public and private, 1975*

Forest type	Species											All species	
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/juniper	Total softwoods	Aspen	Cottonwood	Total hardwoods		
	Thousand cubic feet												*Thousand cubic meters*
Douglas-fir	5,803	1,028	--	2,631	569	--	87	10,118	28	--	28	10,146	287
Ponderosa pine	1,155	37,406	248	--	284	--	658	39,751	--	--	--	39,751	1,126
Spruce-subalpine fir	1,139	234	75	9,843	204	13,274	--	24,769	3,712	56	3,768	28,537	808
White fir	1,332	--	--	272	9,740	--	--	11,344	1,095	--	1,095	12,439	352
Aspen	400	367	--	340	2,105	301	38	3,551	36,621	--	36,621	40,172	1,138
All types	9,829	39,035	323	13,086	12,902	13,575	783	89,533	41,456	56	41,512	131,045	--
	Thousand cubic meters												
All types	278	1,106	9	371	365	384	22	2,535	1,174	2	1,176	--	3,711

Table 20.--*Net volume of sawtimber on commercial timberland in Southwestern Utah by forest type and species; public and private, 1978*

Forest type	Species											
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/juniper	Total softwoods	Aspen	Cottonwood	Total hardwoods	All species
	Thousand board feet, International 1/4-inch rule											
Douglas-fir	27,646	5,460	--	11,524	1,576	--	320	46,526	--	--	--	46,526
Ponderosa pine	5,881	211,755	1,035	--	1,131	--	3,716	223,518	--	--	--	223,518
Spruce-subalpine fir	5,421	1,306	283	38,309	824	65,798	--	111,941	10,034	305	10,339	122,280
White fir	7,147	--	--	1,393	34,223	--	--	42,763	2,720	--	2,720	45,483
Aspen	2,055	2,265	--	557	6,220	1,561	--	12,658	99,872	--	99,872	112,530
All types	48,150	220,786	1,318	51,783	43,974	67,359	4,036	437,406	112,626	305	112,931	550,337

Table 21.--*Net annual growth of growing stock and sawtimber on commercial timberland in Southwestern Utah by ownership class and species, 1978*

Ownership class	Species											
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Total softwoods	Aspen	Cottonwood	Total hardwoods	All species
	GROWING STOCK *Cubic feet*										
Public	81,781	425,178	2,987	97,675	56,391	43,781	707,793	138,497	1,512	140,009	847,802
Private	47,438	184,024	3,874	288,837	274,784	58,959	857,916	922,123	1,263	923,386	1,781,302
Total	129,219	609,202	6,861	386,512	331,175	102,740	1,565,709	1,060,620	2,775	1,063,395	2,629,104
	GROWING STOCK *Cubic meters*										
Public	2,316	12,040	84	2,766	1,597	1,239	20,042	3,922	43	3,965	24,007
Private	1,343	5,211	110	8,179	7,781	1,670	24,294	26,111	36	26,147	50,441
Total	3,659	17,251	194	10,945	9,378	2,909	44,336	30,033	79	30,112	74,448
	SAWTIMBER *Board feet, International 1/4-inch rule*										
Public	527,122	2,599,455	52,861	539,207	245,508	399,175	4,363,328	1,061,104	9,908	1,071,012	5,434,340
Private	388,962	1,100,066	39,500	1,298,842	1,347,673	430,717	4,605,760	6,792,261	8,278	6,800,539	11,406,299
Total	916,084	3,699,521	92,361	1,838,049	1,593,181	829,892	8,969,088	7,853,365	18,186	7,871,551	16,840,639

Table 22.--*Annual mortality of growing stock and sawtimber on commercial timberland in Southwestern Utah by ownership class, and softwoods and hardwoods, 1975*

Species group and ownership class	Growing stock		Sawtimber
	- *Cubic feet* -	- *Cubic meters* -	- *Board feet*[1] -
Softwoods:			
Public	123,074	3,485	521,908
Private	193,021	5,466	706,566
Total	316,095	8,951	1,228,474
Hardwoods:			
Public	6,046	171	--
Private	21,399	606	--
Total	27,445	777	--

[1]International 1/4-inch rule.

Table 23.--*Annual mortality of growing stock and sawtimber on commercial timberland in Southwestern Utah by cause of death and species; public and private, 1978*

Cause of death	Species							All species
	Douglas-fir	Ponderosa pine	Subalpine fir	White fir	Engelmann spruce	Total softwoods	Aspen	
	GROWING STOCK							
	Cubic feet							
Insects	--	25,716	--	--	--	25,716	--	25,716
Disease	10,759	--	--	--	--	10,759	--	10,759
Fire	--	--	--	--	--	--	--	--
Animal	--	--	24,403	--	--	24,403	--	24,403
Weather	--	--	--	--	--	--	--	--
Suppression	--	--	--	--	--	--	--	--
Unknown	57,329	21,934	71,958	28,985	75,011	255,217	27,445	282,662
Logging	--	--	--	--	--	--	--	--
Total	68,088	47,650	96,361	28,985	75,011	316,095	27,445	343,540
	GROWING STOCK							
	Cubic meters							
Insects	--	728	--	--	--	728	--	728
Disease	305	--	--	--	--	305	--	305
Fire	--	--	--	--	--	--	--	--
Animal	--	--	691	--	--	691	--	691
Weather	--	--	--	--	--	--	--	--
Suppression	--	--	--	--	--	--	--	--
Unknown	1,623	621	2,038	821	2,124	7,227	777	8,004
Logging	--	--	--	--	--	--	--	--
Total	1,928	1,349	2,729	821	2,124	8,951	777	9,728
	SAWTIMBER							
	Board feet, International 1/4-inch rule							
Insects	--	154,527	--	--	--	154,527	--	154,527
Disease	41,466	--	--	--	--	41,466	--	41,466
Fire	--	--	--	--	--	--	--	--
Animal	--	--	--	--	--	--	--	--
Weather	--	--	--	--	--	--	--	--
Suppression	--	--	--	--	--	--	--	--
Unknown	170,213	136,729	219,774	125,372	380,393	1,032,481	--	1,032,481
Logging	--	--	--	--	--	--	--	--
Total	211,679	291,256	219,774	125,372	380,393	1,228,474	--	1,228,474

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1979. Forest area and timber resource statistics for southwestern Utah, 1975. USDA Forest Serv. Resourc. Bull. INT-13, 24 p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

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The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

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Dorothy G. Shupe and Michael K. Barrett

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
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RESEARCH SUMMARY

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

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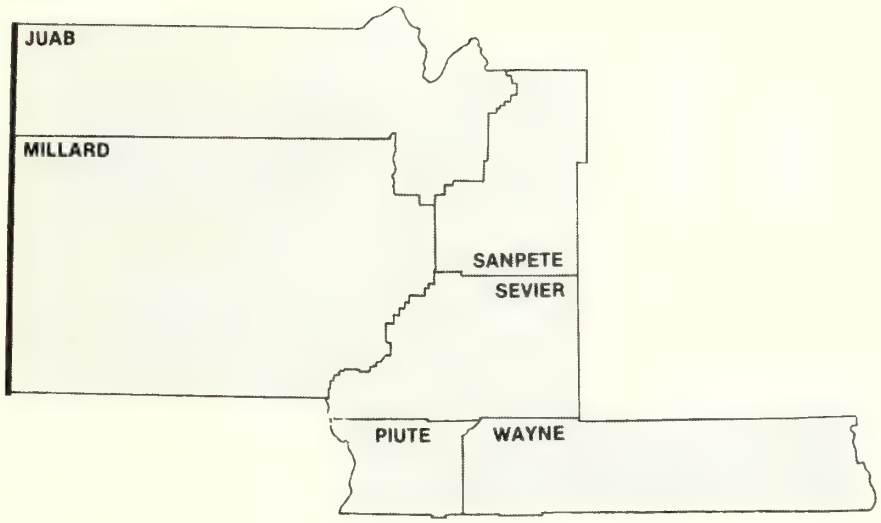
Central Utah



INTRODUCTION

A comprehensive timber resource study was conducted on public and private lands, except National Forest land, in Central Utah in 1976 by the Utah Department of Natural Resources, Division of State Lands and Forestry, in cooperation with the Division of State and Private Forestry, Forest Service, Region 4, and the Intermountain Forest and Range Experiment Station.

Central Utah is comprised of Juab, Millard, Piute, Sanpete, Sevier, and Wayne Counties (fig. 1). Total land area is 10.9 million acres (4.4 million hectares). The largest share of this land is Federally owned. The Bureau of Land Management manages 6.0 million acres (2.4 million hectares) and the Forest Service, 1.9 million acres (0.8 million hectares). Ownership of the remaining area is divided among the State, 0.9 million acres (0.4 million hectares); other public, 0.3 million acres (0.1 million hectares); and private, 1.8 million acres (0.7 million hectares). The data presented here are for public and private lands, BUT EXCLUDE NATIONAL FOREST OWNERSHIP.

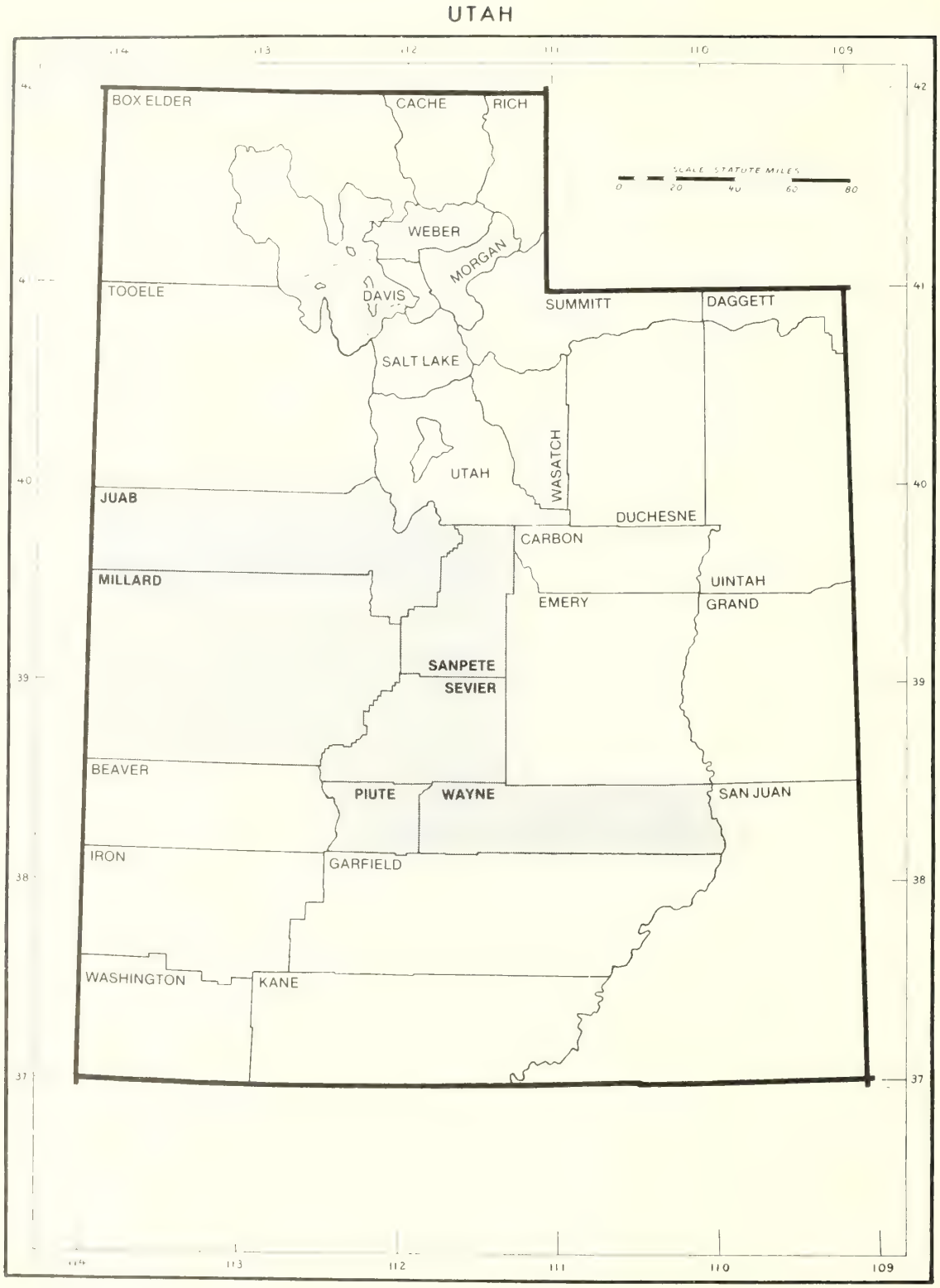


Figure 1.--Central Utah Counties, Juab, Millard, Sanpete, Sevier, Piute, and Wayne.

Highlights show the area of commercial timberland in comparison to total forest land area, and the distribution of this area by forest type, stand-size class, and site class. Discussions of the data reliability and terminology are included. These two items should be reviewed carefully when using this information.

HIGHLIGHTS

Area

- The forest land area includes 1.3 million acres (0.5 million hectares), 14 percent of the total public and private land area.

- Of the forest land, 61 thousand acres (25 thousand hectares), or about 5 percent, are classified as commercial timberland.

- Private ownership accounts for 38 thousand acres (16 thousand hectares), or 63 percent of the commercial timberland.

- Aspen is the predominant forest type on 40 percent of the commercial timberland. Douglas-fir ranks second with 24 percent followed by spruce-subalpine fir with 22 percent. The remaining 14 percent is white fir forest type.

- Sixty-nine percent of the aspen forest type is privately owned.

- Seventy percent of the commercial timberland is in sawtimber stands; poletimber stands occupy 18 percent; the remaining 12 percent is in sapling and seedling stands.

- Over 64 percent of the sawtimber stands is in private ownership.

- Nearly 53 percent of the commercial timberland is in the 20 to 49 cubic-foot productivity class.

Inventory

- Growing stock volume is 102 million cubic feet (3 million cubic meters) with only 51 percent in softwood sawtimber trees.

- Rough, rotten, and salvable dead trees account for 11 million cubic feet (0.3 million cubic meters), or 10 percent of the total sound wood volume.

- About 87 percent of the 332 million board feet[1] of sawtimber volume is in sawtimber trees less than 23.0 inches d.b.h.

- Aspen makes up 43 percent of the growing stock volume.

- Subalpine fir (16 percent), white fir (15 percent), and Engelmann spruce (13 percent) make up 44 percent of the growing stock volume and 58 percent of the sawtimber volume. Species sharing the remaining percentage are Douglas-fir, limber pine, and pinyon/juniper.[2]

- Private owners control 66 percent of the growing stock volume and 64 percent of the sawtimber volume.

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[1] International 1/4-inch rule.

[2] Although pinyon/juniper usually occurs on unproductive forest land, when it occurs in mixtures with other species on productive sites, it is reported in the commercial timberland statistics.

Growth and Mortality

- Net annual growth of growing stock totals 2,481 thousand cubic feet (70 thousand cubic meters) with 64 percent occurring in aspen species. Growth and mortality were not measured for pinyon and juniper trees.

- About 70 percent of the total net growth is on private lands.

- The annual mortality of 512 thousand cubic feet (15 thousand cubic meters) offsets 17 percent of the gross annual growth.

- Sixty-four percent of the mortality occurs in the subalpine fir species.

DATA RELIABILITY

Individual cells within tables should be used with caution. Some are based on very small sample sizes, thus resulting in high sampling errors. The standard error percents shown in tables 1 and 2 were calculated at the 67 percent confidence level.

Table 1.--*Area of forest land and percent standard error for Central Utah, 1976*

Item	Softwood types		Hardwood types		All types	
	Acres	Percent standard error	Acres	Percent standard error	Acres	Percent standard error
Commercial timberland	36,554	14.9	24,140	27.7	60,694	12.5
Other forest land:						
Unproductive reserved	72,409	3.3	1,630	22.2	74,039	3.3
Unproductive nonreserved	949,095	1.0	208,225	4.1	1,157,320	.9

Table 2.--*Net volume and net annual growth and annual mortality of growing stock and sawtimber on commercial timberland, with percent standard error for Central Utah, 1976*

Item	Softwoods		Hardwoods		All species	
	Volume	Percent standard error	Volume	Percent standard error	Volume	Percent standard error
Net volume:						
Growing stock (M cubic feet)	58,509	16.9	43,285	22.4	101,794	14.5
Sawtimber (M board feet[1])	248,217	18.0	83,616	31.3	331,833	17.1
Net annual growth:						
Growing stock (cubic feet)	895,052	32.1	1,586,395	26.9	2,481,447	21.1
Sawtimber (board feet[1])	5,789,904	30.9	4,006,903	37.5	9,796,807	25.1
Annual mortality:						
Growing stock (cubic feet)	460,386	55.1	52,021	72.9	512,407	49.9
Sawtimber (board feet[1])	1,749,890	65.0	107,391	[2]100.0	1,857,281	61.5

[1]International 1/4-inch rule.

[2]Computed standard error exceeds 100 percent.

TERMINOLOGY AND DATA TABLES

The following terminology section contains definitions, taken directly from the Forest Service Forest Survey Handbook, that are relevant to the timber resource data presented in this resource bulletin. Forest area and timber resource data for Central Utah are displayed in tables 3 through 23.

TERMINOLOGY

Land

Bureau of the Census.--The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds less than 40 acres in area.

Water

Census water.--As defined by the Bureau of the Census, streams, sloughs, estuaries, and canals more than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds more than 40 acres in area.

Noncensus water.--The same as defined by the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Land Use Classes

Forest land.--Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Commercial timberland.--Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Productive-reserved forest land.--Forest land sufficiently productive to qualify as commercial timberland, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Other forest land.--(1) Forest land incapable of producing 20 cubic feet per acre of industrial wood under management, because of adverse site conditions; (2) unproductive-reserved forest land.

Nonforest land.--Land that has never supported forests and lands formerly forested where use for timber management is precluded by development for other uses.

Public Ownership Classes

National Forest land.--Federal lands legally designated as National Forest or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands.--Federal lands administered by the Bureau of Land Management.

Indian lands.--Tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

Miscellaneous Federal lands.--Federal lands other than the following: (1) National Forest lands; (2) lands administered by the Bureau of Land Management; and (3) Indian lands.

State.--Lands owned by States, or lands leased to these governmental units for 50 years or more.

County and municipal lands.--Lands owned by counties and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Private Ownership Classes

Forest industry lands.--Lands owned by companies or individuals operating wood-using plants.

Farmer-owned lands.--Lands owned by farm operators. (Note: These exclude lands leased by farm operators from nonfarm owners, such as railroad companies and States.)

Miscellaneous private lands.--Privately owned lands other than forest industry and farmer-owned lands.

Forest Type and Tree Species

Forest types.--A classification of forest land based upon the species forming a plurality of live-tree stocking.

Forest trees.--Woody plants having a well-developed stem and usually more than 12 feet in height at maturity.

Commercial species.--Tree species presently or prospectively suitable for industrial wood products.

Softwoods.--Coniferous trees, usually evergreen, having needles or scalelike leaves.

Hardwoods.--Dicotyledonous trees, usually broad-leaved and deciduous.

Area Condition Classes

Stocking.--Stocking is an effort to express the extent to which growing space is effectively utilized by present or potential growing stock trees or commercial species. "Percent of stocking" is synonymous with "percentage of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

"Stocking percentages" express current area occupancy in relation to specified standards for full stocking based on number, size, and spacing of trees considered necessary to fully utilize the forest land.

Full utilization of the site is assumed to occur over a range of basal area. As an interim guide 60 percent of the normal yield table values has been used to establish the lower limit of the range which represents full-site occupancy. This is called 100-percent stocking. The upper limit of full stocking has been set at 132 percent. Sites with less than 100-percent stocking represent understocking with less than full-site occupancy. Overstocking is characterized by sites with over 133-percent stocking.

Class 10.--Area fully stocked (100-132 percent) with desirable trees and not overstocked (133 percent or more).

Class 20.--Area fully stocked with desirable trees, but overstocked with all live trees.

Class 30.--Areas medium to fully stocked (60-99 percent) with desirable trees and with less than 30 percent of the area controlled by other trees and (or) inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

Class 40.--Areas medium to fully stocked with desirable trees and with 30 percent or more of the area controlled by other trees and (or) conditions that ordinarily prevent occupancy by desirable trees.

Class 50.--Areas poorly stocked (16.7-59 percent) with desirable trees, but fully stocked with growing stock trees.

Class 60.--Areas poorly stocked with desirable trees, but with medium to full stocking of growing stock trees.

Class 70.--Areas nonstocked (less than 16.7 percent) or poorly stocked with desirable trees, and poorly stocked with growing stock trees.

Class 80.--Low-risk old-growth stands.

Class 90.--High-risk old-growth stands.

Nonstocked.--Areas less than 16.7 percent stocked with growing stock trees.

Class of Timber

Growing stock trees.--Live trees of commercial species qualifying as desirable or acceptable trees. (Note: Excludes rough, rotten, and dead trees.)

Desirable trees.--Growing stock trees (a) having no serious defect in quality limiting present or prospective use for timber products; (b) of relatively high vigor; and (c) containing no pathogens that may result in death or serious deterioration before rotation age.

Acceptable trees.--Growing stock trees that meet specified standards of size and quality, but not qualifying as desirable trees.

Rough trees.--(1) Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of roughness or poor form; (2) all live trees of noncommercial species.

Rotten trees.--Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume (cubic-foot basis) in a tree is rotten.

Cull.--Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Salvable dead trees.--Standing or down dead trees that are considered merchantable by Rocky Mountain Regional standards.

Mortality trees.--Trees formerly growing stock dying from natural causes during a specified period, usually annually.

Saw log portion.--That part of the bole of sawtimber trees between the stump and the saw log top. A 1-foot stump is used.

Upper-stem portion.--That part of the bole of sawtimber trees above the saw log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs, whichever occurs first.

Tree Size Classes

Seedlings.--Live trees less than 1.0 inch in diameter at breast height.

Saplings.--Trees 1.0-4.9 inches in diameter at breast height.

Poletimber trees.--Trees at least 5.0 inches in d.b.h., but smaller than sawtimber size.

Sawtimber trees.--Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches, and 11.0 inches for hardwoods.

Volume

Net volume.--Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Growing stock volume.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

Sawtimber volume.--Net volume in board feet of sawtimber trees of commercial species. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

Growth and Mortality

Net annual growth.--The increase in net growing stock volume of a specified size class for a specific year. (Note: Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus net volume of trees reaching the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten trees during the year.)

Mortality.--Number or sound-wood volume of growing stock trees dying from natural causes during a specified period.

Site

Site class.--A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean net annual growth of growing stock (not including thinnings or mortality loss) attainable at culmination of mean net annual growth over age. Height-age relationships are usually used as indicators of the specified volume-site class.

Stand-Size Classes

Sawtimber stands.--Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.--Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and (or) sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.--Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and (or) seedlings.

Nonstocked land.--Commercial timberland less than 16.7 percent stocked with growing stock trees.

Table 3.--*Total area in Central Utah by ownership class, 1976*

Ownership class	Acres	Hectares
National Forest	1,933,845	782,603
Bureau of Land Management	5,936,581	2,402,459
Indian	36,844	14,910
Miscellaneous Federal	281,601	113,960
State	905,799	366,565
County and municipal	1,030	417
Private	1,765,420	714,443
Total land area	10,861,120	4,395,357
Census water	38,528	15,592
Gross area[1]	10,899,648	4,410,949

[1]U.S. Bureau of the Census, land and water area of the United States, 1970.

Table 4.--*Land area in Central Utah by major land class and ownership class, 1976*

Land class	Ownership class			
	Public		Private	
	Acres	Hectares	Acres	Hectares
Commercial timberland	22,364	9,050	38,330	15,512
Productive reserved	--	--	--	--
Other forest land:				
Unproductive reserved	73,785	29,860	254	102
Unproductive nonreserved	857,748	347,120	299,572	121,233
Total forest land	953,897	386,030	338,156	136,847
Nonforest land	6,207,958	2,512,281	1,427,264	577,596
Total land area	7,161,855	2,898,311	1,765,420	714,443

Table 5.--*Area of commercial timberland in Central Utah by forest type, stand-size class, and site class, public owned, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
				Acres		
Douglas-fir:						
Sawtimber	--	--	--	1,838	2,964	4,802
Poletimber	--	--	--	--	427	427
Sapling and seedling	--	--	--	--	863	863
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,838	4,254	6,092
Spruce-subalpine fir:						
Sawtimber	--	--	1,482	1,219	1,725	4,426
Poletimber	--	--	--	--	636	636
Sapling and seedling	--	--	--	--	619	619
Nonstocked	--	--	--	--	--	--
Total	--	--	1,482	1,219	2,980	5,681
White fir:						
Sawtimber	--	--	--	2,999	--	2,999
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	2,999	--	2,999
Aspen:						
Sawtimber	--	--	--	2,080	849	2,929
Poletimber	--	--	--	--	2,001	2,001
Sapling and seedling	--	--	--	--	2,662	2,662
Nonstocked	--	--	--	--	--	--
Total	--	--	--	2,080	5,512	7,592
All types:						
Sawtimber	--	--	1,482	8,136	5,538	15,156
Poletimber	--	--	--	--	3,064	3,064
Sapling and seedling	--	--	--	--	4,144	4,144
Nonstocked	--	--	--	--	--	--
Total	--	--	1,482	8,136	12,746	22,364

Table 6.--*Area of commercial timberland in Central Utah by forest type, stand-size class, and site class, private owned, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	--	2,632	3,098	5,730
Poletimber	--	--	--	--	1,925	1,925
Sapling and seedling	--	--	--	--	975	975
Nonstocked	--	--	--	--	--	--
Total	--	--	--	2,632	5,998	8,630
Spruce-subalpine fir:						
Sawtimber	--	--	1,549	2,058	2,825	6,432
Poletimber	--	--	--	--	533	533
Sapling and seedling	--	--	--	--	574	574
Nonstocked	--	--	--	--	--	--
Total	--	--	1,549	2,058	3,932	7,539
White fir:						
Sawtimber	--	--	--	5,613	--	5,613
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	5,613	--	5,613
Aspen:						
Sawtimber	--	--	--	7,203	2,460	9,663
Poletimber	--	--	--	--	5,164	5,164
Sapling and seedling	--	--	--	--	1,721	1,721
Nonstocked	--	--	--	--	--	--
Total	--	--	--	7,203	9,345	16,548
All types:						
Sawtimber	--	--	1,549	17,506	8,383	27,438
Poletimber	--	--	--	--	7,622	7,622
Sapling and seedling	--	--	--	--	3,270	3,270
Nonstocked	--	--	--	--	--	--
Total	--	--	1,549	17,506	19,275	38,330

Table 7.--*Area of commercial timberland in Central Utah by forest type, stand-size class, and site class, summary--public and private, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
			Acres			
Douglas-fir:						
Sawtimber	--	--	--	4,470	6,062	10,532
Poletimber	--	--	--	--	2,352	2,352
Sapling and seedling	--	--	--	--	1,838	1,838
Nonstocked	--	--	--	--	--	--
Total	--	--	--	4,470	10,252	14,722
Spruce-subalpine fir:						
Sawtimber	--	--	3,031	3,277	4,550	10,858
Poletimber	--	--	--	--	1,169	1,169
Sapling and seedling	--	--	--	--	1,193	1,193
Nonstocked	--	--	--	--	--	--
Total	--	--	3,031	3,277	6,912	13,220
White fir:						
Sawtimber	--	--	--	8,612	--	8,612
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	8,612		8,612
Aspen:						
Sawtimber	--	--	--	9,283	3,309	12,592
Poletimber	--	--	--	--	7,165	7,165
Sapling and seedling	--	--	--	--	4,383	4,383
Nonstocked	--	--	--	--	--	--
Total	--	--	--	9,283	14,857	24,140
All types:						
Sawtimber	--	--	3,031	25,642	13,921	42,594
Poletimber	--	--	--	--	10,686	10,686
Sapling and seedling	--	--	--	--	7,414	7,414
Nonstocked	--	--	--	--	--	--
Total	--	--	3,031	25,642	32,021	60,694

Table 8.--*Area of commercial timberland in Central Utah by stand volume and ownership classes, 1976*

Stand volume per acre[1]	Ownership class		
	Public	Private	Public and private
	Acres		
Less than 1,500 board feet	6,618	10,276	16,894
1,500 to 4,999 board feet	5,405	9,033	14,438
5,000 to 9,999 board feet	6,907	13,483	20,390
10,000 board feet or more	3,434	5,538	8,972
All classes	22,364	38,330	60,694

[1]International 1/4-inch rule.

Table 9.--*Area of commercial timberland in Central Utah by forest type and area condition class; public and private, 1976*

Forest type	Area condition class									Nonstocked	All classes	
	10	20	30	40	50	60	70	80	90			
	Acres											*Hectares*
Douglas-fir	--	--	1,164	--	1,838	6,302	1,193	--	4,225	--	14,722	5,958
Spruce-subalpine fir	--	--	1,193	--	6,102	3,031	565	--	2,329	--	13,220	5,350
White fir	--	--	1,194	--	2,035	4,190	1,193	--	--	--	8,612	3,485
Aspen	--	--	4,384	--	12,040	6,444	--	--	1,272	--	24,140	9,769
All types	--	--	7,935	--	22,015	19,967	2,951	--	7,826	--	60,694	24,562

Table 10.--*Area of productive reserved and other forest land in Central Utah by land class, ownership class, and forest type, 1976*

Land class	Forest type					All types	
	Douglas-fir	Limber pine	Pinyon-juniper	Aspen	Mixed hardwoods[1]		
	Acres						*Hectares*
Productive reserved area							
Public	--	--	--	--	--	--	--
Private	--	--	--	--	--	-	--
Other forest land area:							
Unproductive nonreserved:							
Public	3,525	1,499	792,984	6,467	53,273	857,748	347,120
Private	2,697	1,508	146,882	12,918	135,567	299,572	121,233
Unproductive reserved:							
Public	--	--	72,240	--	1,545	73,785	29,860
Private	--	--	169	--	85	254	102
Total all areas:							
Public	3,525	1,499	865,224	6,467	54,818	931,533	376,980
Private	2,697	1,508	147,051	12,918	135,652	299,826	121,335
Total acres	6,222	3,007	1,012,275	19,385	190,470	1,231,359	--
Total hectares	2,518	1,217	409,655	7,845	77,080	--	498,315

[1]Usually oak, willow, or maple.

Table 11.--*Number of growing stock trees on commercial timberland in Central Utah by species and diameter class; public and private, 1976*

Species	Diameter class (inches at breast height)															
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand trees															
Douglas-fir	493	342	573	258	344	128	79	44	22	6	8	4	2	4	9	2,316
Limber pine	--	--	--	22	25	--	--	--	--	--	--	--	--	--	--	47
Subalpine fir	1,298	541	303	291	291	131	93	69	59	19	10	4	3	1	1	3,114
White fir	273	296	289	198	214	105	100	73	50	38	17	10	2	3	6	1,674
Engelmann spruce	458	232	102	102	98	77	67	63	31	15	16	12	5	5	6	1,289
Pinyon/juniper	71	--	117	61	24	--	--	4	--	--	3	--	--	--	1	281
Total softwoods	2,593	1,411	1,384	932	996	441	339	253	162	78	54	30	12	13	23	8,721
Aspen	1,717	2,054	3,225	1,930	845	539	179	62	27	9	3	--	--	--	--	10,590
All species	4,310	3,465	4,609	2,862	1,841	980	518	315	189	87	57	30	12	13	23	19,311

Table 12.--*Number of cull and salvable dead trees on commercial timberland in Central Utah by ownership class, and softwoods and hardwoods, 1976*

Ownership class and species group	Cull trees			Salvable dead trees
	Sound	Rotten	Total	
	Thousand trees			
Public:				
Softwoods	284	8	292	245
Hardwoods	100	66	166	124
Total	384	74	458	369
Private:				
Softwoods	540	9	549	307
Hardwoods	339	178	517	354
Total	879	187	1,066	661
Public and private:				
Softwoods	824	17	841	552
Hardwoods	439	244	683	478
Total	1,263	261	1,524	1,030

Table 15.--*Net volume of growing stock on commercial timberland in Central Utah by ownership class, forest type, and stand-size class, 1976*

Ownership class	Forest type	Stand-size class				All classes	
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked		
		Thousand cubic feet					*Thousand cubic meters*
Public:							
	Douglas-fir	8,375	227	99	--	8,701	246
	Spruce-subalpine fir	11,512	665	164	--	12,341	350
	White fir	3,707	--	--	--	3,707	105
	Aspen	5,518	4,250	463	--	10,231	289
	All types	29,112	5,142	726	--	34,980	990
Private:							
	Douglas-fir	10,152	1,022	112	--	11,286	320
	Spruce-subalpine fir	17,414	558	152	--	18,124	513
	White fir	7,612	--	--	--	7,612	215
	Aspen	18,055	11,437	300	--	29,792	844
	All types	53,233	13,017	564	--	66,814	1,892
Public and private:							
	Douglas-fir	18,527	1,249	211	--	19,987	566
	Spruce-subalpine fir	28,926	1,223	316	--	30,465	863
	White fir	11,319	--	--	--	11,319	320
	Aspen	23,573	15,687	763	--	40,023	1,133
	All types	82,345	18,159	1,290	--	101,794	2,882

Table 14.--*Net volume of sawtimber on commercial timberland in Central Utah by ownership class, forest type, and stand-size class, 1976*

Ownership class	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked	
		Thousand board feet[1]				
Public:						
	Douglas-fir	33,942	492	306	--	34,740
	Spruce-subalpine fir	48,081	1,694	444		50,219
	White fir	13,235	--	--	--	13,235
	Aspen	18,990	3,557	198	--	22,745
	All types	114,248	5,743	948	--	120,939
Private:						
	Douglas-fir	39,641	2,221	345	--	42,207
	Spruce-subalpine fir	71,418	1,421	411	--	73,250
	White fir	25,488	--	--	--	25,488
	Aspen	59,832	9,988	129	--	69,949
	All types	196,379	13,630	885	--	210,894
Public and private:						
	Douglas-fir	73,583	2,713	651	--	76,947
	Spruce-subalpine fir	119,499	3,115	855	--	123,469
	White fir	38,723	--	--	--	38,723
	Aspen	78,822	13,545	327	--	92,694
	All types	310,627	19,373	1,833	--	331,833

[1]International 1/4-inch rule.

Table 15.--*Net volume of growing stock on commercial timberland in Central Utah by species and diameter class; public and private, 1976*

Species	Diameter class (inches at breast height)													
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand cubic feet													
Douglas-fir	701	1,215	2,644	1,914	1,608	1,349	862	226	493	290	96	381	1,565	13,344
Limber pine	--	104	144	--	--	--	--	--	--	--	--	--	--	248
Subalpine fir	575	1,486	2,653	2,290	2,121	2,045	2,503	1,239	658	299	328	111	156	16,464
White fir	481	900	1,709	1,360	2,064	1,963	1,925	1,546	1,017	733	158	295	526	14,677
Engelmann spruce	139	501	973	1,190	1,594	2,171	1,603	837	1,143	1,155	468	616	1,005	13,395
Pinyon/juniper	64	95	119	--	--	34	--	--	28	--	--	--	41	381
Total softwoods	1,960	4,301	8,242	6,754	7,387	7,562	6,893	3,848	3,339	2,477	1,050	1,403	3,293	58,509
Aspen	7,481	10,942	9,416	8,677	3,843	1,545	953	312	116	--	--	--	--	43,285
All species	9,441	15,243	17,658	15,431	11,230	9,107	7,846	4,160	3,455	2,477	1,050	1,403	3,293	101,794

Table 16.--*Net volume of sawtimber on commercial timberland in Central Utah by species and diameter class; public and private, 1976*

Species	Diameter class (inches at breast height)												
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand board feet, International 1/4-inch rule											
Douglas-fir	8,580	8,378	7,780	7,034	4,690	1,265	2,793	1,666	552	2,211	9,175	54,124
Limber pine	486	--	--	--	--	--	--	--	--	--	--	486
Subalpine fir	11,121	11,273	10,833	10,540	12,864	6,364	3,398	1,553	1,735	598	847	71,126
White fir	6,706	5,964	9,452	8,904	8,455	6,505	4,109	2,881	618	1,156	2,088	56,838
Engelmann spruce	4,042	5,841	8,201	11,271	8,303	4,324	5,910	6,008	2,453	3,264	5,381	64,998
Pinyon/juniper	356	--	--	97	--	--	77	--	--	--	115	645
Total softwoods	31,291	31,456	36,266	37,846	34,312	18,458	16,287	12,108	5,358	7,229	17,606	248,217
Aspen	0	45,928	21,407	8,693	5,277	1,693	618	--	--	--	--	83,616
All species	31,291	77,384	57,673	46,539	39,589	20,151	16,905	12,108	5,358	7,229	17,606	331,833

Table 17.--*Net volume of growing stock and sawtimber on commercial timberland in Central Utah by ownership class and species, 1976*

Ownership class	Species								All species
	Douglas-fir	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/ juniper	Total softwoods	Aspen	
	GROWING STOCK *Thousand cubic feet*								
Public	5,713	90	6,198	5,700	5,084	137	22,922	12,058	34,980
Private	7,631	158	10,266	8,977	8,311	244	35,587	31,227	66,814
Total	13,344	248	16,464	14,677	13,395	381	58,509	43,285	101,794
	GROWING STOCK *Thousand cubic meters*								
Public	162	3	175	161	144	4	649	341	990
Private	216	4	291	255	235	7	1,008	884	1,892
Total	378	7	466	416	379	11	1,657	1,225	2,882
	SAWTIMBER *Thousand board feet, International 1/4-inch rule*								
Public	23,455	138	26,462	22,370	24,403	236	97,064	23,875	120,939
Private	30,669	348	44,664	34,468	40,595	409	151,153	59,741	210,894
Total	54,124	486	71,126	56,838	64,998	645	248,217	83,616	331,833

Table 18.--*Net volume of timber on commercial timberland in Central Utah by class of timber, and softwoods and hardwoods; public and private, 1976*

Class of timber	Softwoods	Hardwoods	All classes
	Thousand cubic feet		
Sawtimber trees:			
Saw-log portion	49,458	14,604	64,062
Upper-stem portion	2,790	842	3,632
Total	52,248	15,446	67,694
Poletimber trees	6,261	27,839	34,100
All growing stock trees	58,509	43,285	101,794
Sound cull trees	996	1,379	2,375
Rotten cull trees	160	943	1,103
Salvable dead trees	6,216	1,694	7,910
All timber	65,881	47,301	113,182

Table 19.--*Net volume of growing stock on commercial timberland in Central Utah by forest type and species; public and private, 1976*

Forest type	Species								All species	
	Douglas-fir	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/ juniper	Total softwoods	Aspen		
	Thousand cubic feet									*Thousand Cubic meters*
Douglas-fir	12,389	104	426	5,566	--	47	18,532	1,455	19,987	566
Spruce-subalpine fir	--	144	12,783	--	10,846	--	23,773	6,692	30,465	863
White fir	343	--	493	8,427	--	161	9,424	1,895	11,319	320
Aspen	612	--	2,762	684	2,549	173	6,780	33,243	40,023	1,133
All types	13,344	248	16,464	14,677	13,395	381	58,509	43,285	101,794	--
	Thousand cubic meters									
All types	378	7	466	416	379	11	1,657	1,225	--	2,882

Table 20.--*Net volume of sawtimber on commercial timberland in Central Utah by forest type and species; public and private, 1976*

Forest type	Species								All species
	Douglas-fir	Limber Pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/ juniper	Total softwoods	Aspen	
	Thousand board feet, International 1/4-inch rule								
Douglas-fir	51,818	--	2,080	21,172	--	77	75,147	1,800	76,947
Spruce-subalpine fir	--	486	54,597	--	52,126	--	107,209	16,260	123,469
White fir	1,547	--	2,221	32,747	--	287	36,802	1,921	38,723
Aspen	759	--	12,228	2,919	12,872	281	29,059	63,635	92,694
All types	54,124	486	71,126	56,838	64,998	645	248,217	83,616	331,833

Table 21.--*Net annual growth of growing stock and sawtimber on commercial timberland in Central Utah by ownership class and species, 1976*

Ownership class	Species							All species
	Douglas-fir	Limber pine	Subalpine fir	White fir	Engelmann spruce	Total softwoods	Aspen	
	GROWING STOCK *Cubic feet*							
Public	58,858	2,184	44,422	113,911	112,553	331,928	415,960	747,888
Private	137,082	2,891	64,460	194,557	164,134	563,124	1,170,435	1,733,559
Total	195,940	5,075	108,882	308,468	276,687	895,052	1,586,395	2,481,447
	GROWING STOCK *Cubic meters*							
Public	1,666	62	1,258	3,226	3,187	9,399	11,779	21,178
Private	3,882	82	1,825	5,509	4,648	15,946	33,143	49,089
Total	5,548	144	3,083	8,735	7,835	25,345	44,922	70,267
	SAWTIMBER *Board feet, International 1/4-inch rule*							
Public	319,722	1,782	648,378	642,357	531,868	2,144,107	1,173,938	3,318,045
Private	612,355	4,468	1,142,952	1,081,942	804,080	3,645,797	2,832,965	6,478,762
Total	932,077	6,250	1,791,330	1,724,299	1,335,948	5,789,904	4,006,903	9,796,807

Table 22.--*Annual mortality of growing stock and sawtimber on commercial timberland in Central Utah by ownership class, and softwoods and hardwoods, 1976*

Species group and ownership class	Growing stock		Sawtimber
	Cubic feet	*Cubic meters*	*Board feet*[1]
Softwoods:			
Public	200,223	5,670	687,302
Private	260,163	7,367	1,062,588
Total	460,386	13,037	1,749,890
Hardwoods:			
Public	13,304	377	31,885
Private	38,717	1,096	75,506
Total	52,021	1,473	107,391

[1]International 1/4-inch rule.

Table 23.--*Annual mortality of growing stock and sawtimber on commercial timberland in Central Utah by cause of death and species; public and private, 1976*

Cause of death	Species					All species
	Douglas-fir	Subalpine fir	White fir	Total softwoods	Aspen	
	GROWING STOCK *Cubic feet*					
Insects	115,558	--	--	115,558	--	115,558
Disease	--	--	--	--	32,596	32,596
Fire	--	--	--	--	--	--
Animal	--	--	--	--	--	--
Weather	--	--	--	--	19,425	19,425
Suppression	--	--	--	--	--	--
Unknown	--	325,538	19,290	344,828	--	344,828
Logging	--	--	--	--	--	--
Total	115,558	325,538	19,290	460,386	52,021	512,407
	GROWING STOCK *Cubic meters*					
Insects	3,273	--	--	3,273	--	3,273
Disease	--	--	--	--	923	923
Fire	--	--	--	--	--	--
Animal	--	--	--	--	--	--
Weather	--	--	--	--	550	550
Suppression	--	--	--	--	--	--
Unknown	--	9,218	546	9,764	--	9,764
Logging	--	--	--	--	--	--
Total	3,273	9,218	546	13,037	1,473	14,510
	SAWTIMBER *Board feet, International 1/4-inch rule*					
Insects	258,492	--	--	258,492	--	258,492
Disease	--	--	--	--	--	--
Fire	--	--	--	--	--	--
Animal	--	--	--	--	--	--
Weather	--	--	--	--	107,391	107,391
Suppression	--	--	--	--	--	--
Unknown	--	1,491,398	--	1,491,398	--	1,491,398
Logging	--	--	--	--	--	--
Total	258,492	1,491,398	--	1,749,890	107,391	1,857,281

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Shupe, Dorothy G., and Michael K. Barrett.
1979. Forest area and timber resource statistics for Central Utah, 1976. USDA For. Serv. Resour. Bull. INT-14, 23 p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

KEYWORDS: forest surveys (regional), forest area classification, stand volume.

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The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

The Intermountain Station includes the States of Montana, Idaho, Utah, Nevada, and western Wyoming. About 273 million acres, or 85 percent, of the land area in the Station territory are classified as forest and rangeland. These lands include grasslands, deserts, shrublands, alpine areas, and well-stocked forests. They supply fiber for forest industries; minerals for energy and industrial development; and water for domestic and industrial consumption. They also provide recreation opportunities for millions of visitors each year.

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FOREST AREA AND TIMBER RESOURCE STATISTICS FOR SOUTHEASTERN UTAH 1975-1976

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FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE

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RESEARCH SUMMARY

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

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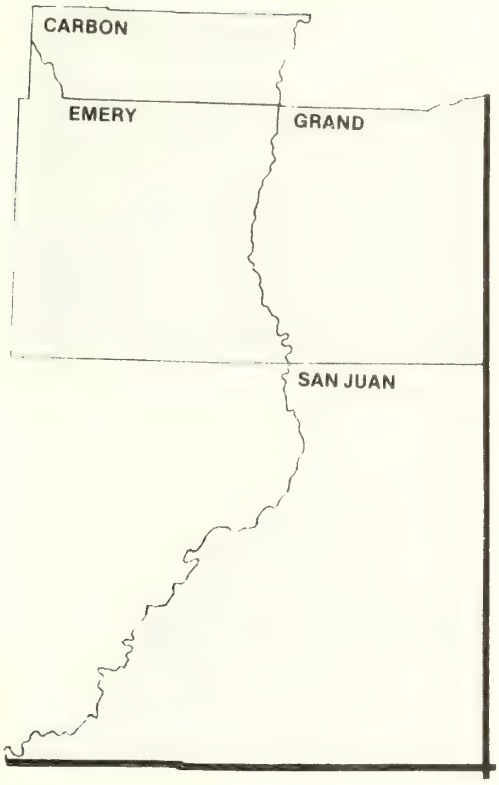
Southeastern Working Circle Utah



INTRODUCTION

A comprehensive timber resource study was conducted on public and private lands, except National Forest land, in Southeastern Utah in 1975-1976 by the Utah Department of Natural Resources, Division of State Lands and Forestry, in cooperation with the Division of State and Private Forestry, Forest Service, Region 4, and the Intermountain Forest and Range Experiment Station.

Southeastern Utah is comprised of Carbon, Emery, Grand, and San Juan Counties (fig. 1). The total land area is 11.1 million acres (4.5 million hectares). The Bureau of Land Management administers the largest portion of this land, 6.0 million acres (2.4 million hectares). The ownership of the remainder is Indian, 1.4 million acres (0.6 million hectares); private, 1.3 million acres (0.6 million hectares); State, 1.0 million acres (0.4 million hectares); Forest Service, 0.8 million acres (0.3 million hectares); and other public, 0.6 million acres (0.2 million hectares).

The data presented here are for public and private lands, BUT EXCLUDE NATIONAL FOREST OWNERSHIP.

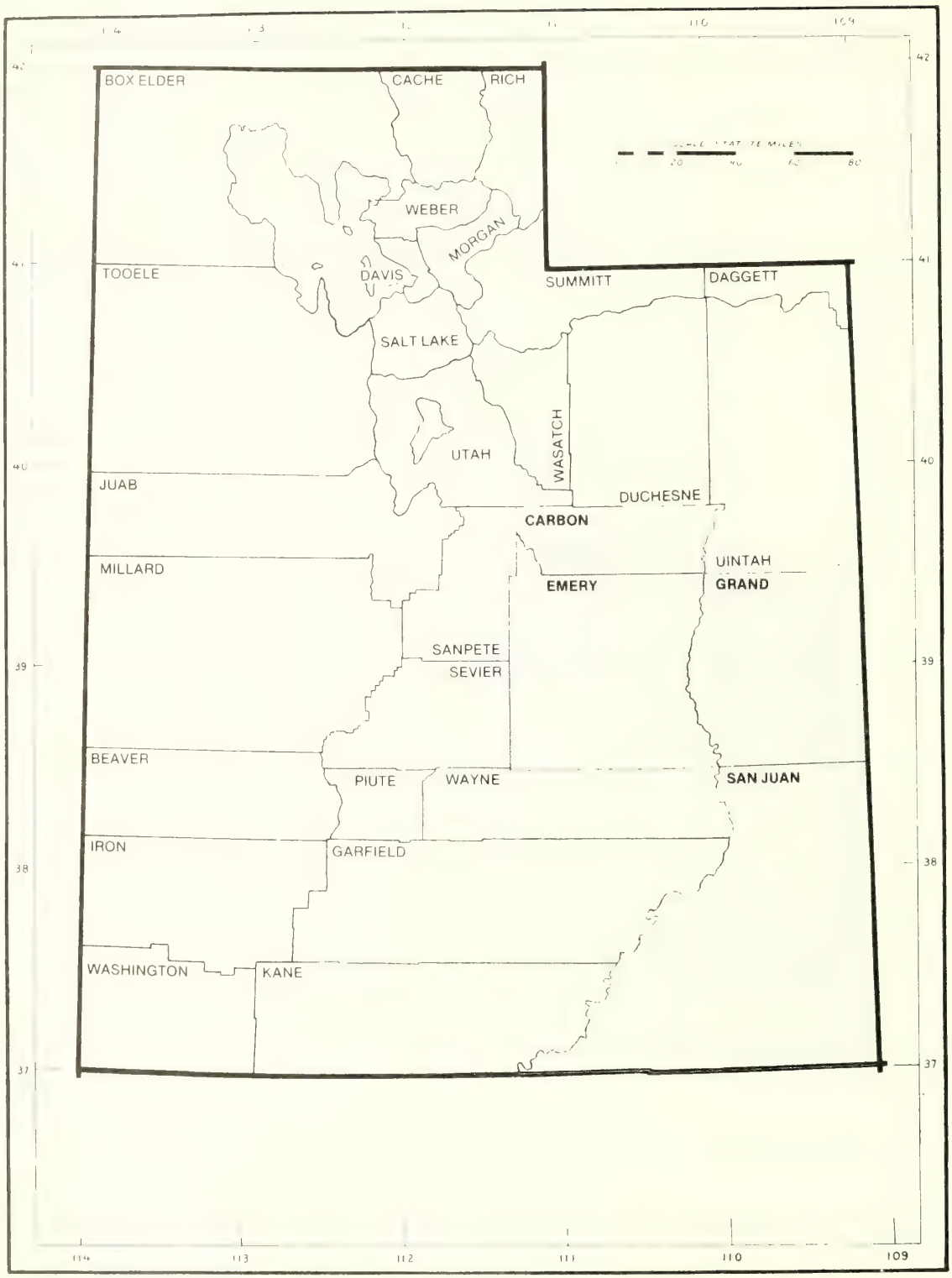


Figure 1.--Southeastern Utah counties, Carbon, Emery, Grand, and San Juan.

Highlights show the area of commercial timberland in comparison to total forest land area, and the distribution of this area by forest type, stand-size class, and site class. Discussions of the data reliability and terminology are included. These two items should be reviewed carefully when using this information.

HIGHLIGHTS

Area

- The forest land area is 2.7 million acres (1.1 million hectares), or 27 percent of the total public and private land area.

- Of the forest land, 253 thousand acres (103 thousand hectares) or about 9 percent is classified as commercial timberland.

- Public ownership accounts for 152 thousand acres (62 thousand hectares), or 60 percent, of the commercial timberland.

- Aspen forest type occupies 30 percent of the commercial timberland. Of this, 54 percent is privately owned.

- The predominant softwood forest types are Douglas-fir and ponderosa pine which together occupy 51 percent of the commercial timberland. The remaining area consists of spruce-subalpine fir, limber pine, pinyon-juniper[1], white fir, aspen, and a negligible amount of cottonwood.

- Sixty-nine percent of the commercial timberland is sawtimber stands; poletimber stands occupy 18 percent. The remaining 13 percent is in sapling and seedling stands or nonstocked.

- Nearly 64 percent of the sawtimber stands is in public ownership.

- Nearly 56 percent of the commercial timberland is in the 20 to 49 cubic-foot productivity class.

Inventory

- Growing stock volume amounts to 359 million cubic feet (10 million cubic meters) with 53 percent in softwood sawtimber trees.

- Rough, rotten, and salvable dead trees comprise 30 million cubic feet (1 million cubic meters), or about 8 percent, of the total sound wood volume.

- Eighty-four percent of the 1,246 million board feet[2] of sawtimber volume is in sawtimber trees less than 23.0 inches d.b.h.

- Aspen makes up 37 percent of the total growing stock volume.

---

[1]The area occupied by pinyon-juniper forest type classified as commercial is so classified because the site index for other associated species in these stands (usually ponderosa pine or Douglas-fir) was high enough to produce 20 cubic feet per acre per year average annual growth, and nonstockable indicators were not present in sufficient quantities to lower yield capability below 20 cubic feet per acre per year. Although pinyon/juniper usually occurs on unproductive forest land, when it occurs in mixtures with other species on productive sites, it is reported in the commercial timberland statistics.

[2]International 1/4-inch rule.

- Douglas-fir (24 percent), subalpine fir (19 percent), and Engelmann spruce (9 percent) make up 52 percent of the total growing stock volume and 61 percent of the total sawtimber volume. Species sharing the remaining percentage are ponderosa pine, limber pine, pinyon/juniper, and white fir.

- Public owners control 53 percent of the growing stock volume and 57 percent of the sawtimber volume.

Growth and Mortality

- Net annual growth of growing stock totals 8,127 thousand cubic feet (230 thousand cubic meters) with 41 percent occurring in aspen species. Growth and mortality are not measured for pinyon and juniper trees.

- Net growth is divided equally between public and private owners.

- The annual mortality of 1,930 thousand cubic feet (55 thousand cubic meters) offsets 19 percent of the gross annual growth.

- Disease, insects, and weather account for 47 percent of the mortality. The remainder is caused by fire, animal, and unknown factors.

- Sixty-one percent of the mortality occurs in the aspen species.

DATA RELIABILITY

Individual cells within tables should be used with caution. Some are based on very small sample sizes, thus resulting in high sampling errors. The standard error percents shown in tables 1 and 2 were calculated at the 67 percent confidence level.

Table 1.--*Area of forest land and percent standard error for Southeastern Utah, 1976*

Item	Softwood types		Hardwood types		All types	
	Acres	Percent standard error	Acres	Percent standard error	Acres	Percent standard error
Commercial timberland	176,550	10.7	76,831	17.4	253,381	8.3
Productive reserved	4,490	13.8	586	39.0	5,076	12.9
Other forest land:						
Unproductive reserved	61,596	3.7	139	69.4	61,735	3.7
Unproductive nonreserved	2,363,054	1.0	52,914	20.6	2,415,968	1.0

Table 2.--*Net volume and net annual growth and annual mortality of growing stock and sawtimber on commercial timberland, with percent standard error for Southeastern Utah, 1976*

Item	Softwoods		Hardwoods		All species	
	Volume	Percent standard error	Volume	Percent standard error	Volume	Percent standard error
Net volume:						
Growing stock (M cubic feet)	224,989	11.8	133,886	14.9	358,875	9.5
Sawtimber (M board feet[1])	940,634	12.9	305,002	21.1	1,245,636	11.3
Net annual growth:						
Growing stock (cubic feet)	4,813,086	13.3	3,313,572	19.6	8,126,658	11.3
Sawtimber (board feet[1])	23,315,363	17.6	16,467,683	37.0	39,783,046	17.5
Annual mortality:						
Growing stock (cubic feet)	744,153	28.7	1,185,535	36.6	1,929,688	26.3
Sawtimber (board feet[1])	2,804,768	28.9	2,324,739	54.4	5,129,507	30.9

[1]International 1/4-inch rule.

TERMINOLOGY AND DATA TABLES

The following terminology section contains definitions taken directly from the Forest Service Forest Survey Handbook that are relevant to the timber resource data presented in this resource bulletin. Forest area and timber resource data for Southeastern Utah are displayed in tables 3 through 23.

TERMINOLOGY

Land

Bureau of the Census.--The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds less than 40 acres in area.

Water

Census water.--As defined by the Bureau of the Census: streams, sloughs, estuaries, and canals more than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds more than 40 acres in area.

Noncensus water.--The same as defined by the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Land Use Classes

Forest land.--Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Commercial timberland.--Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying have the capability of producing in excess of 20 feet per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Productive-reserved forest land.--Forest land sufficiently productive to qualify as commercial timberland, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Other forest land.--(1) Forest land incapable of producing 20 cubic feet per acre of industrial wood under management, because of adverse site conditions; (2) unproductive-reserved forest land.

Nonforest land.--Land that has never supported forests and lands formerly forested where use for timber management is precluded by development for other uses.

Public Ownership Classes

National Forest land.--Federal lands legally designated as National Forest or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands.--Federal lands administered by the Bureau of Land Management.

Indian lands.--Tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

Miscellaneous Federal lands.--Federal lands other than the following: (1) National Forest lands; (2) lands administered by the Bureau of Land Management; and (3) Indian lands.

State.--Lands owned by States, or lands leased to these governmental units for 50 years or more.

County and municipal lands.--Lands owned by counties and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Private Ownership Classes

Forest industry lands.--Lands owned by companies or individuals operating wood-using plants.

Farmer-owned lands.--Lands owned by farm operators. (Note: These exclude lands leased by farm operators from nonfarm owners, such as railroad companies and States.)

Miscellaneous private lands.--Privately owned lands other than forest industry and farmer-owned lands.

Forest Type and Tree Species

Forest types.--A classification of forest land based upon the species forming a plurality of live-tree stocking.

Forest trees.--Woody plants having a well-developed stem and usually more than 12 feet in height at maturity.

Commercial species.--Tree species presently or prospectively suitable for industrial wood products.

Softwoods.--Coniferous trees, usually evergreen, having needles or scalelike leaves.

Hardwoods.--Dicotyledonous trees, usually broad-leaved and deciduous.

Area Condition Classes

Stocking.--Stocking is an effort to express the extent to which growing space is effectively utilized by present or potential growing stock trees or commercial species. "Percent of stocking" is synonymous with "percentage of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

"Stocking percentages" express current area occupancy in relation to specified standards for full stocking based on number, size, and spacing of trees considered necessary to fully utilize the forest land.

Full utilization of the site is assumed to occur over a range of basal area. As an interim guide, 60 percent of the normal yield table values has been used to establish the lower limit of this range which represents full-site occupancy. This is called 100-percent stocking. The upper limit of full stocking has been set at 132 percent. Sites with less than 100-percent stocking represent understocking with less than full-site occupancy. Overstocking is characterized by sites with over 133-percent stocking.

Class 10.--Area fully stocked (100-132 percent) with desirable trees and not overstocked (133 percent or more).

Class 20.--Area fully stocked with desirable trees, but overstocked with all live trees.

Class 30.--Areas medium to fully stocked (60-99 percent) with desirable trees and with less than 30 percent of the area controlled by other trees and (or) inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

Class 40.--Areas medium to fully stocked with desirable trees and with 30 percent or more of the area controlled by other trees and (or) conditions that ordinarily prevent occupancy by desirable trees.

Class 50.--Areas poorly stocked (16.7-59 percent) with desirable trees, but fully stocked with growing stock trees.

Class 60.--Areas poorly stocked with desirable trees, but with medium to full stocking of growing stock trees.

Class 70.--Areas nonstocked (less than 16.7 percent) or poorly stocked with desirable trees, and poorly stocked with growing stock trees.

Class 80.--Low-risk old-growth stands.

Class 90.--High-risk old-growth stands.

Nonstocked.--Areas less than 16.7 percent stocked with growing stock trees.

Class of Timber

Growing stock trees.--Live trees of commercial species qualifying as desirable or acceptable trees. (Note: Excludes rough, rotten, and dead trees.)

Desirable trees.--Growing stock trees (a) having no serious defect in quality limiting present or prospective use for timber products; (b) of relatively high vigor; and (c) containing no pathogens that may result in death or serious deterioration before rotation age.

Acceptable trees.--Growing stock trees that meet specified standards of size and quality, but not qualifying as desirable trees.

Rough trees.--(1) Live trees (commercial species) that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of roughness or poor form; (2) all live trees of noncommercial species.

Rotten trees.--Live trees that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume (cubic-foot basis) in a tree is rotten.

Cull.--Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Salvable dead trees.--Standing or down dead trees that are considered merchantable by Rocky Mountain Regional standards.

Mortality trees.--Trees formerly growing stock dying from natural causes during a specified period, usually annually.

Saw log portion.--That part of the bole of sawtimber trees between the stump and the saw log top. A 1-foot stump is used.

Upper-stem portion.--That part of the bole of sawtimber trees above the saw log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs, whichever occurs first.

Tree Size Classes

Seedlings.--Live trees less than 1.0 inch in diameter at breast height.

Saplings.--Trees 1.0-4.9 inches in diameter at breast height.

Poletimber trees.--Trees at least 5.0 inches in d.b.h., but smaller than sawtimber size.

Sawtimber trees.--Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches, and 11.0 inches for hardwoods.

Volume

Net volume.--Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Growing stock volume.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

Sawtimber volume.--Net volume in board feet of sawtimber trees of commercial species. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

Growth and Mortality

Net annual growth.--The increase in net growing stock volume of a specified size class for a specific year. (Note: Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus net volume of trees reaching the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten trees during the year.)

Mortality.--Number or sound-wood volume of growing stock trees dying from natural causes during a specified period.

Site

Site class.--A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean net annual growth of growing stock (not including thinnings or mortality loss) attainable at culmination of mean net annual growth over age. Height-age relationships are usually used as indicators of the specified volume-site class.

Stand-Size Classes

Sawtimber stands.--Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.--Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and (or) sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.--Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and (or) seedlings.

Nonstocked land.--Commercial timberland less than 16.7 percent stocked with growing stock trees.

Table 3.--*Total area in Southeastern Utah by ownership class, 1976*

Ownership class	Acres	Hectares
National Forest	750,382	303,670
Bureau of Land Management	5,990,810	2,424,405
Indian	1,407,126	569,446
Miscellaneous Federal	568,889	230,222
State	1,048,274	424,223
County and municipal	922	373
Private	1,308,605	529,576
Total land area	11,075,008	4,481,915
Census water	156,992	63,533
Gross area[1]	11,232,000	4,545,448

[1]U.S. Bureau of the Census, land and water area of the United States, 1970.

Table 4.--*Land area in Southeastern Utah by major land class and ownership class, 1976*

Land class	Ownership class			
	Public		Private	
	Acres	Hectares	Acres	Hectares
Commercial timberland	152,099	61,553	101,282	40,987
Productive reserved	5,076	2,054	--	--
Other forest land:				
Unproductive reserved	61,735	24,983	--	--
Unproductive nonreserved	2,172,759	879,288	243,209	98,424
Total forest land	2,391,669	967,878	344,491	139,411
Nonforest land	6,624,352	2,680,791	964,114	390,165
Total land area	9,016,021	3,648,669	1,308,605	529,576

Table 5.--*Area of commercial timberland in Southeastern Utah by forest type, stand-size class, and site class, public owned, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	--	10,946	35,213	46,159
Poletimber	--	--	--	--	917	917
Sapling and seedling	--	--	--	1,912	4,039	5,951
Nonstocked	--	--	--	--	--	--
Total	--	--	--	12,858	40,169	53,027
Ponderosa pine:						
Sawtimber	--	--	--	1,950	26,760	28,710
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	5,990	995	6,985
Total	--	--	--	7,940	27,755	35,695
Limber pine:						
Sawtimber	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	5,990	5,990
Total	--	--	--	--	5,990	5,990
Spruce-subalpine fir:						
Sawtimber	--	--	9,435	5,171	--	14,606
Poletimber	--	--	1,912	1,951	--	3,863
Sapling and seedling	--	--	--	554	--	554
Nonstocked	--	--	--	--	--	--
Total	--	--	11,347	7,676	--	19,023
White fir:						
Sawtimber	--	--	--	1,451	--	1,451
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,451	--	1,451
Pinyon-juniper:						
Sawtimber	--	--	--	--	1,910	1,910
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	1,910	1,910
Aspen:						
Sawtimber	--	--	1,141	14,919	3,091	19,151
Poletimber	--	--	1,557	5,491	7,102	14,150
Sapling and seedling	--	--	--	--	1,179	1,179
Nonstocked	--	--	--	--	461	461
Total	--	--	2,698	20,410	11,833	34,941
Cottonwood:						
Sawtimber	--	--	--	--	62	62
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	62	62
All types:						
Sawtimber	--	--	10,576	34,437	67,036	112,049
Poletimber	--	--	3,469	7,442	8,019	18,930
Sapling and seedling	--	--	--	2,466	5,218	7,684
Nonstocked	--	--	--	5,990	7,446	13,436
Total	--	--	14,045	50,335	87,719	152,099

Table 6.--*Area of commercial timberland in Southeastern Utah by forest type, stand-size class, and site class, private owned, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	--	7,844	15,716	23,560
Poletimber	--	--	--	--	1,124	1,124
Sapling and seedling	--	--	--	874	2,875	3,749
Nonstocked	--	--	--	--	--	--
Total	--	--	--	8,718	19,715	28,433
Ponderosa pine:						
Sawtimber	--	--	--	1,160	8,167	9,327
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	1,259	712	1,971
Total	--	--	--	2,419	8,879	11,298
Limber pine:						
Sawtimber	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	1,259	1,259
Total	--	--	--	--	1,259	1,259
Spruce-subalpine fir:						
Sawtimber	--	--	6,876	6,426	--	13,302
Poletimber	--	--	875	1,159	--	2,034
Sapling and seedling	--	--	--	1,107	--	1,107
Nonstocked	--	--	--	--	--	--
Total	--	--	7,751	8,692	--	16,443
White fir:						
Sawtimber	--	--	--	1,124	--	1,124
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,124	--	1,124
Pinyon-juniper:						
Sawtimber	--	--	--	--	897	897
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	897	897
Aspen:						
Sawtimber	--	--	894	6,504	7,413	14,811
Poletimber	--	--	2,411	8,621	12,526	23,558
Sapling and seedling	--	--	--	--	2,670	2,670
Nonstocked	--	--	--	--	711	711
Total	--	--	3,305	15,125	23,320	41,750
Cottonwood:						
Sawtimber	--	--	--	--	78	78
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	78	78
All types:						
Sawtimber	--	--	7,770	23,058	32,271	63,099
Poletimber	--	--	3,286	9,780	13,650	26,716
Sapling and seedling	--	--	--	1,981	5,545	7,526
Nonstocked	--	--	--	1,259	2,682	3,941
Total	--	--	11,056	36,078	54,148	101,282

Table 7.--*Area of commercial timberland in Southeastern Utah by forest type, stand-size class, and site class, summary--public and private, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
				Acres		
Douglas-fir:						
Sawtimber	--	--	--	18,790	50,929	69,719
Poletimber	--	--	--	--	2,041	2,041
Sapling and seedling	--	--	--	2,786	6,914	9,700
Nonstocked	--	--	--	--	--	--
Total	--	--	--	21,576	59,884	81,460
Ponderosa pine:						
Sawtimber	--	--	--	3,110	34,927	38,037
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	7,249	1,707	8,956
Total	--	--	--	10,359	36,634	46,993
Limber pine:						
Sawtimber	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	7,249	7,249
Total	--	--	--	--	7,249	7,249
Spruce-subalpine fir:						
Sawtimber	--	--	16,311	11,597	--	27,908
Poletimber	--	--	2,787	3,110	--	5,897
Sapling and seedling	--	--	--	1,661	--	1,661
Nonstocked	--	--	--	--	--	--
Total	--	--	19,098	16,368	--	35,466
White fir:						
Sawtimber	--	--	--	2,575	--	2,575
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	2,575	--	2,575
Pinyon-juniper:						
Sawtimber	--	--	--	--	2,807	2,807
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	2,807	2,807
Aspen:						
Sawtimber	--	--	2,035	21,423	10,504	33,962
Poletimber	--	--	3,968	14,112	19,628	37,708
Sapling and seedling	--	--	--	--	3,849	3,849
Nonstocked	--	--	--	--	1,172	1,172
Total	--	--	6,003	35,535	35,153	76,691
Cottonwood:						
Sawtimber	--	--	--	--	140	140
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	140	140
All types:						
Sawtimber	--	--	18,346	57,495	99,307	175,148
Poletimber	--	--	6,755	17,222	21,669	45,646
Sapling and seedling	--	--	--	4,447	10,763	15,210
Nonstocked	--	--	--	7,249	10,128	17,377
Total	--	--	25,101	86,413	141,867	253,381

Table 8.--*Area of commercial timberland in Southeastern Utah by stand volume and ownership classes, 1976*

Stand volume per acre[1]	Ownership class		
	Public	Private	Public and private
	Acres		
Less than 1,500 board feet	26,218	19,992	46,210
1,500 to 4,999 board feet	70,268	39,915	110,183
5,000 to 9,999 board feet	39,457	24,144	63,601
10,000 board feet or more	16,156	17,231	33,387
All classes	152,099	101,282	253,381

[1]International 1/4-inch rule.

Table 9.--*Area of commercial timberland in Southeastern Utah by forest type and area condition class; public and private, 1976*

Forest type	Area condition class									Nonstocked	All classes	
	10	20	30	40	50	60	70	80	90			
	Acres											*Hectares*
Douglas-fir	--	1,404	6,628	--	5,594	21,667	13,510	9,314	23,343	--	81,460	32,966
Ponderosa pine	--	--	--	--	--	9,011	17,284	--	11,742	8,956	46,993	19,017
Limber pine	--	--	--	--	--	--	--	--	--	7,249	7,249	2,933
Spruce-subalpine fir	--	1,660	11,353	--	3,064	14,567	--	4,822	--	--	35,466	14,353
White fir	--	--	--	--	2,575	--	--	--	--	--	2,575	1,042
Pinyon-juniper	--	--	--	--	--	--	1,403	--	1,404	--	2,807	1,136
Aspen	--	--	9,661	--	27,604	21,678	12,140	--	4,436	1,172	76,691	31,036
Cottonwood	--	--	--	--	140	--	--	--	--	--	140	57
All types	--	3,064	27,642	--	38,977	66,923	44,337	14,136	40,925	17,377	253,381	102,540

Table 10.--*Area of productive reserved and other forest land in Southeastern Utah by land class, ownership class, and forest type, 1976*

Land class	Forest type											
	Douglas-fir	Ponderosa pine	Limber pine	Spruce-subalpine fir	White fir	Pinyon-juniper	Mixed softwoods	Aspen	Cottonwood	Mixed hardwoods	All types	
	Acres											*Hectares*
Productive reserved area:												
Public	2,302	1,083	88	886	110	21	--	586	--	--	5,076	2,054
Private	--	--	--	--	--	--	--	--	--	--	--	--
Other forest land area:												
Unproductive nonreserved:												
Public	6,985	5,990	5,990	5,990	--	2,124,410	955	12,862	2,900	6,677	2,172,759	879,288
Private	1,970	1,259	1,259	1,259	--	206,538	449	23,410	4,165	2,900	243,209	98,424
Unproductive reserved:												
Public	197	88	87	88	--	61,126	10	34	17	88	61,735	24,983
Private	--	--	--	--	--	--	--	--	--	--	--	--
Total all areas:												
Public	9,484	7,161	6,165	6,964	110	2,185,557	965	13,482	2,917	6,765	2,239,570	906,325
Private	1,970	1,259	1,259	1,259	--	206,538	449	23,410	4,165	2,900	243,209	98,424
Total acres	11,454	8,420	7,424	8,223	110	2,392,095	1,414	36,892	7,082	9,665	2,482,779	--
Total hectares	4,635	3,407	3,004	3,328	45	968,051	572	14,930	2,866	3,911	--	1,004,749

Table 11.--*Number of growing stock trees on commercial timberland in Southeastern Utah by species and diameter class; public and private, 1976*

Species	Diameter class (inches at breast height)															
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand trees															
Douglas-fir	4,691	3,025	2,279	1,573	1,202	904	785	344	198	106	55	63	16	8	24	15,273
Ponderosa pine	697	900	322	490	254	155	146	98	60	42	72	18	32	17	18	3,321
Limber pine	--	84	71	17	--	28	46	6	12	3	2	--	--	--	--	269
Subalpine fir	5,975	4,687	2,848	1,470	714	587	432	271	95	54	51	26	10	6	3	17,229
White fir	647	381	112	139	153	53	46	14	9	--	3	3	--	1	--	1,561
Engelmann spruce	638	790	812	528	252	118	70	30	71	22	30	20	26	10	9	3,426
Pinyon/juniper	219	478	555	172	149	74	33	34	140	25	2	10	--	13	18	1,922
Total softwoods	12,867	10,345	6,999	4,389	2,724	1,919	1,558	797	585	252	215	140	84	55	72	43,001
Aspen	5,626	9,486	7,650	4,023	3,137	1,552	721	259	48	6	1	3	[1]	--	--	32,512
Cottonwood	--	--	--	4	1	3	5	3	1	2	[1]	--	--	--	[1]	19
Total hardwoods	5,626	9,486	7,650	4,027	3,138	1,555	726	262	49	8	1	3	[1]	--	[1]	32,531
All species	18,493	19,831	14,649	8,416	5,862	3,474	2,284	1,059	634	260	216	143	84	55	72	75,532

[1]Less than 0.5 thousand trees.

Table 12.--*Number of cull and salvable dead trees on commercial timberland in Southeastern Utah by ownership class, and softwoods and hardwoods, 1976*

Ownership class and species group	Cull trees			Salvable dead trees
	Sound	Rotten	Total	
	Thousand trees			
Public:				
Softwoods	2,240	166	2,406	821
Hardwoods	1,261	355	1,616	823
Total	3,501	521	4,022	1,644
Private:				
Softwoods	1,351	80	1,431	527
Hardwoods	1,518	556	2,074	1,052
Total	2,869	636	3,505	1,579
Public and private:				
Softwoods	3,591	246	3,837	1,348
Hardwoods	2,779	911	3,690	1,875
Total	6,370	1,157	7,527	3,223

Table 15.--*Net volume of growing stock on commercial timberland in Southeastern Utah by ownership class, forest type, and stand-size class, 1976*

Ownership class	Forest type	Stand-size class				All classes	
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked		
		Thousand cubic feet					*Thousand cubic meters*
Public:							
	Douglas-fir	54,761	785	2,263	--	57,809	1,637
	Ponderosa pine	18,086	--	--	2,270	20,356	576
	Limber pine	--	--	--	307	307	8
	Spruce-subalpine fir	46,048	9,085	171	--	55,304	1,566
	White fir	1,954	--	--	--	1,954	55
	Pinyon-juniper	907	--	--	--	907	26
	Aspen	34,614	19,963	187	132	54,896	1,555
	Cottonwood	202	--	--	--	202	6
	All types	156,572	29,833	2,621	2,709	191,735	5,429
Private:							
	Douglas-fir	31,793	966	1,599	--	34,358	973
	Ponderosa pine	6,536	--	--	506	7,042	200
	Limber pine	--	--	--	65	65	2
	Spruce-subalpine fir	38,586	4,668	341	--	43,595	1,234
	White fir	1,543	--	--	--	1,543	44
	Pinyon-juniper	425	--	--	--	425	12
	Aspen	39,784	39,425	441	204	79,854	2,261
	Cottonwood	258	--	--	--	258	7
	All types	118,925	45,059	2,381	775	167,140	4,733
Public and private:							
	Douglas-fir	86,554	1,751	3,862	--	92,167	2,610
	Ponderosa pine	24,622	--	--	2,776	27,398	776
	Limber pine	--	--	--	372	372	10
	Spruce-subalpine fir	84,634	13,753	512	--	98,899	2,800
	White fir	3,497	--	--	--	3,497	99
	Pinyon-juniper	1,332	--	--	--	1,332	38
	Aspen	74,398	59,388	628	336	134,750	3,816
	Cottonwood	460	--	--	--	460	13
	All types	275,497	74,892	5,002	3,484	358,875	10,162

Table 14.--*Net volume of sawtimber on commercial timberland in Southeastern Utah by ownership class, forest type, and stand-size class, 1976*

Ownership class	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked	
		Thousand board feet[1]				
Public:						
	Douglas-fir	223,112	1,845	6,219	--	231,176
	Ponderosa pine	84,855	--	--	13,720	98,575
	Limber pine	--	--	--	1,790	1,790
	Spruce-subalpine fir	190,042	12,364	--	--	202,406
	White fir	7,194	--	--	--	7,194
	Pinyon-juniper	3,538	--	--	--	3,538
	Aspen	131,879	33,372	484	585	166,320
	Cottonwood	1,056	--	--	--	1,056
	All types	641,676	47,581	6,703	16,095	712,055
Private:						
	Douglas-fir	123,246	2,322	5,267	--	130,835
	Ponderosa pine	29,600	--	--	3,025	32,625
	Limber pine	--	--	--	376	376
	Spruce-subalpine fir	146,700	6,468	--	--	153,168
	White fir	5,643	--	--	--	5,643
	Pinyon-juniper	1,661	--	--	--	1,661
	Aspen	140,956	64,860	1,210	904	207,930
	Cottonwood	1,343	--	--	--	1,343
	All types	449,149	73,650	6,477	4,305	533,581
Public and private:						
	Douglas-fir	346,358	4,167	11,486	--	362,011
	Ponderosa pine	114,455	--	--	16,745	131,200
	Limber pine	--	--	--	2,166	2,166
	Spruce-subalpine fir	336,742	18,832	--	--	355,574
	White fir	12,837	--	--	--	12,837
	Pinyon-juniper	5,199	--	--	--	5,199
	Aspen	272,835	98,232	1,694	1,489	374,250
	Cottonwood	2,399	--	--	--	2,399
	All types	1,090,825	121,231	13,180	20,400	1,245,636

[1]International 1/4-inch rule.

Table 15.--*Net volume of growing stock on commercial timberland in Southeastern Utah by species and diameter class; public and private, 1978*

Species	Diameter class (inches at breast height)													
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand cubic feet													
Douglas-fir	3,910	7,129	10,912	12,864	15,706	9,882	7,178	4,821	3,221	4,339	1,074	818	3,297	85,151
Ponderosa pine	769	1,894	1,615	2,140	2,469	2,665	2,122	1,859	3,921	1,256	3,211	2,024	3,173	29,118
Limber pine	102	65	--	311	698	99	271	67	117	--	--	--	--	1,730
Subalpine fir	5,953	8,815	8,248	9,516	10,076	8,889	4,340	3,120	3,415	2,357	1,011	767	430	66,937
White fir	189	472	1,096	520	822	324	275	--	143	183	--	120	--	4,144
Engelmann spruce	2,218	3,072	2,881	2,066	2,209	1,414	4,933	1,817	2,799	2,576	3,761	1,642	1,856	33,244
Pinyon/juniper	114	315	454	197	152	353	1,683	270	35	160	--	330	602	4,665
Total softwoods	13,255	21,762	25,206	27,614	32,132	23,626	20,802	11,954	13,651	10,871	9,057	5,701	9,358	224,989
Aspen	17,449	24,656	35,675	28,066	17,376	7,951	1,887	233	12	149	13	--	--	133,467
Cottonwood	--	12	8	68	113	77	48	62	21	--	--	--	10	419
Total hardwoods	17,449	24,668	35,683	28,134	17,489	8,028	1,935	295	33	149	13	--	10	133,886
All species	30,704	46,430	60,889	55,748	49,621	31,654	22,737	12,249	13,684	11,020	9,070	5,701	9,368	358,875

Table 16.--*Net volume of sawtimber on commercial timberland in Southeastern Utah by species and diameter class; public and private, 1976*

Species	Diameter class (inches at breast height)											
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand board feet, International 1/4-inch rule											
Douglas-fir	35,782	55,279	76,066	51,347	38,881	26,836	18,253	24,898	6,206	4,744	19,284	357,576
Ponderosa pine	5,912	10,147	12,616	14,615	12,091	10,815	23,263	7,521	19,449	12,320	19,688	148,437
Limber pine	--	1,272	3,231	483	1,372	347	627	--	--	--	--	7,332
Subalpine fir	34,956	46,581	51,519	45,810	22,307	16,018	17,635	12,289	5,345	4,096	2,342	258,898
White fir	4,227	2,280	3,758	1,476	1,195	--	586	721	--	473	--	14,716
Engelmann spruce	11,954	9,941	11,346	7,340	25,543	9,381	14,477	13,401	19,763	8,699	9,925	141,770
Pinyon/juniper	1,361	588	441	996	4,649	733	95	440	--	921	1,681	11,905
Total softwoods	94,192	126,088	158,977	122,067	106,038	64,130	74,936	59,270	50,763	31,253	52,920	940,634
Aspen	0	148,440	96,992	44,732	10,460	1,267	66	783	69	--	--	302,809
Cottonwood	0	362	633	436	266	334	111	--	--	--	51	2,193
Total hardwoods	0	148,802	97,625	45,168	10,726	1,601	177	783	69	--	51	305,002
All species	94,192	274,890	256,602	167,235	116,764	65,731	75,113	60,053	50,832	31,253	52,971	1,245,636

Table 17.--*Net volume of growing stock and sawtimber on commercial timberland in Southeastern Utah by ownership class and species, 1976*

Ownership class	Species											
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/juniper	Total softwoods	Aspen	Cottonwood	Total hardwoods	All species
	GROWING STOCK *Thousand cubic feet*											
Public	54,536	20,419	1,042	35,884	2,441	21,499	3,743	139,364	52,187	184	52,371	191,735
Private	30,815	8,699	688	31,053	1,703	11,745	922	85,625	81,280	235	81,515	167,140
Total	85,151	29,118	1,730	66,937	4,144	33,244	4,665	224,989	133,467	419	133,886	358,875
	GROWING STOCK *Thousand cubic meters*											
Public	1,538	578	30	1,016	69	609	106	3,946	1,478	5	1,483	5,429
Private	873	247	19	880	48	332	26	2,425	2,301	7	2,308	4,733
Total	2,411	825	49	1,896	117	941	132	6,371	3,779	12	3,791	10,162
	SAWTIMBER *Thousand board feet, International 1/4-inch rule*											
Public	233,171	103,879	4,427	138,068	8,669	91,964	9,594	589,772	121,318	965	122,283	712,055
Private	124,405	44,558	2,905	120,830	6,047	49,806	2,311	350,862	181,491	1,228	182,719	533,581
Total	357,576	148,437	7,332	258,898	14,716	141,770	11,905	940,634	302,809	2,193	305,002	1,245,636

Table 18.--*Net volume of timber on commercial timberland in Southeastern Utah by class of timber, and softwoods and hardwoods; public and private, 1976*

Class of timber	Softwoods	Hardwoods	All classes
	Thousand cubic feet		
Sawtimber trees:			
Saw-log portion	180,443	53,123	233,566
Upper-stem portion	9,529	2,963	12,492
Total	189,972	56,086	246,058
Poletimber trees	35,017	77,800	112,817
All growing stock trees	224,989	133,886	358,875
Sound cull trees	5,124	4,826	9,950
Rotten cull trees	1,688	2,339	4,027
Salvable dead trees	9,632	6,407	16,039
All timber	241,433	147,458	388,891

Table 19.--*Net volume of growing stock on commercial timberland in Southeastern Utah by forest type and species; public and private, 1976*

Forest type	Species											All species	
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/juniper	Total softwoods	Aspen	Cottonwood	Total hardwoods		
	Thousand cubic feet												*Thousand cubic meters*
Douglas-fir	74,611	2,269	1,730	2,660	1,643	226	4,183	87,322	4,845	--	4,845	92,167	2,610
Ponderosa pine	3,240	23,272	--	--	--	--	--	26,512	886	--	886	27,398	776
Limber pine	372	--	--	--	--	--	--	372	--	--	--	372	10
Spruce-subalpine fir	3,024	535	--	47,821	--	31,581	--	82,961	15,938	--	15,938	98,899	2,800
White fir	373	--	--	--	2,501	578	--	3,452	45	--	45	3,497	99
Pinyon-juniper	850	--	--	--	--	--	482	1,332	--	--	--	1,332	38
Aspen	2,681	3,042	--	16,456	--	818	--	22,997	111,753	--	111,753	134,750	3,816
Cottonwood	--	--	--	--	--	41	--	41	--	419	419	460	13
All types	85,151	29,118	1,730	66,937	4,144	33,244	4,665	224,989	133,467	419	133,886	358,875	--
	Thousand cubic meters												
All types	2,411	825	49	1,896	117	941	132	6,371	3,779	12	3,791	--	10,162

Table 20.--*Net volume of sawtimber on commercial timberland in Southeastern Utah by forest type and species; public and private, 1976*

Forest type	Species											All species
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/juniper	Total softwoods	Aspen	Cottonwood	Total hardwoods	
	Thousand board feet, International 1/4-inch rule											
Douglas-fir	310,028	12,682	7,332	5,024	5,835	856	10,943	352,700	9,311	--	9,311	362,011
Ponderosa pine	14,987	115,536	--	--	--	--	--	130,523	677	--	677	131,200
Limber pine	2,166	--	--	--	--	--	--	2,166	--	--	--	2,166
Spruce-subalpine fir	13,916	3,155	--	182,513	--	135,248	--	334,832	20,742	--	20,742	355,574
White fir	1,904	--	--	--	8,881	2,052	--	12,837	--	--	--	12,837
Pinyon-juniper	4,237	--	--	--	--	--	962	5,199	--	--	--	5,199
Aspen	10,338	17,064	--	71,361	--	3,408	--	102,171	272,079	--	272,079	374,250
Cottonwood	--	--	--	--	--	206	--	206	--	2,193	2,193	2,399
All types	357,576	148,437	7,332	258,898	14,716	141,770	11,905	940,634	302,809	2,193	305,002	1,245,636

Table 21.--*Net annual growth of growing stock and sawtimber on commercial timberland in Southeastern Utah by ownership class and species, 1976*

Ownership class	Species										
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Total softwoods	Aspen	Cottonwood	Total hardwoods	All species
	GROWING STOCK *Cubic feet*										
Public	861,875	502,550	14,003	1,014,053	57,724	444,440	2,894,645	1,143,645	4,267	1,147,912	4,042,557
Private	532,256	185,129	9,373	904,084	37,255	250,344	1,918,441	2,160,230	5,430	2,165,660	4,084,101
Total	1,394,131	687,679	23,376	1,918,137	94,979	694,784	4,813,086	3,303,875	9,697	3,313,572	8,126,658
	GROWING STOCK *Cubic meters*										
Public	24,405	14,231	397	28,715	1,634	12,585	81,967	32,384	121	32,505	114,472
Private	15,072	5,242	265	25,601	1,055	7,089	54,324	61,171	154	61,325	115,649
Total	39,477	19,473	662	54,316	2,689	19,674	136,291	93,555	275	93,830	230,121
	SAWTIMBER *Board feet, International 1/4-inch rule*										
Public	3,856,027	2,960,330	69,147	5,328,929	762,671	1,732,451	14,709,555	5,020,307	22,919	5,043,226	19,752,781
Private	2,329,546	991,480	45,423	3,468,683	476,108	1,294,568	8,605,808	11,395,291	29,166	11,424,457	20,030,265
Total	6,185,573	3,951,810	114,570	8,797,612	1,238,779	3,027,019	23,315,363	16,415,598	52,085	16,467,683	39,783,046

Table 22.--*Annual mortality of growing stock and sawtimber on commercial timberland in Southeastern Utah by ownership class, and softwoods and hardwoods, 1976*

Species group and ownership class	Growing stock		Sawtimber
	- Cubic feet -	*- Cubic meters -*	*- Board feet*[1] *-*
Softwoods:			
Public	427,449	12,104	1,607,699
Private	316,704	8,968	1,197,069
Total	744,153	21,072	2,804,768
Hardwoods:			
Public	634,541	17,968	1,453,715
Private	550,994	15,603	871,024
Total	1,185,535	33,571	2,324,739

[1]International 1/4-inch rule.

Table 23.--*Annual mortality of growing stock and sawtimber on commercial timberland in Southeastern Utah by cause of death and species; public and private, 1976*

Cause of death	Species							All species
	Douglas-fir	Ponderosa pine	Subalpine fir	White fir	Engelmann spruce	Total softwoods	Aspen	
	GROWING STOCK							
	Cubic feet							
Insects	166,522	--	87,202	--	--	253,724	--	253,724
Disease	62,567	--	28,611	--	--	91,178	419,668	510,846
Fire	12,250	48,195	--	--	--	60,445	--	60,445
Animal	--	--	8,919	--	--	8,919	34,860	43,779
Weather	18,380	--	18,498	--	--	36,878	111,185	148,063
Suppression	--	--	--	--	--	--	--	--
Unknown	100,600	--	135,066	13,570	43,773	293,009	619,822	912,831
Logging	--	--	--	--	--	--	--	--
Total	360,319	48,195	278,296	13,570	43,773	744,153	1,185,535	1,929,688
	GROWING STOCK							
	Cubic meters							
Insects	4,716	--	2,469	--	--	7,185	--	7,185
Disease	1,771	--	810	--	--	2,581	11,884	14,465
Fire	347	1,365	--	--	--	1,712	--	1,712
Animal	--	--	253	--	--	253	987	1,240
Weather	520	--	524	--	--	1,044	3,149	4,193
Suppression	--	--	--	--	--	--	--	--
Unknown	2,849	--	3,824	384	1,240	8,297	17,551	25,848
Logging	--	--	--	--	--	--	--	--
Total	10,203	1,365	7,880	384	1,240	21,072	33,571	54,643
	SAWTIMBER							
	Board feet, International 1/4-inch rule							
Insects	612,302	--	425,638	--	--	1,037,940	--	1,037,940
Disease	225,555	--	--	--	--	225,555	1,427,835	1,653,390
Fire	59,455	290,462	--	--	--	349,917	--	349,917
Animal	--	--	--	--	--	--	--	--
Weather	--	--	95,087	--	--	95,087	615,907	710,994
Suppression	--	--	--	--	--	--	--	--
Unknown	365,031	--	534,401	62,222	134,615	1,096,269	280,997	1,377,266
Logging	--	--	--	--	--	--	--	--
Total	1,262,343	290,462	1,055,126	62,222	134,615	2,804,768	2,324,739	5,129,507

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Shupe, Dorothy G., and Michael K. Barrett.
1979. Forest area and timber resource statistics for Southeastern Utah, 1975-1976. USDA For. Serv. Resour. Bull. INT-15, 23 p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

KEYWORDS: forest surveys (regional), forest area classification, stand volume.

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FOREST AREA AND TIMBER RESOURCE STATISTICS FOR SANTA FE COUNTY, NEW MEXICO, 1975

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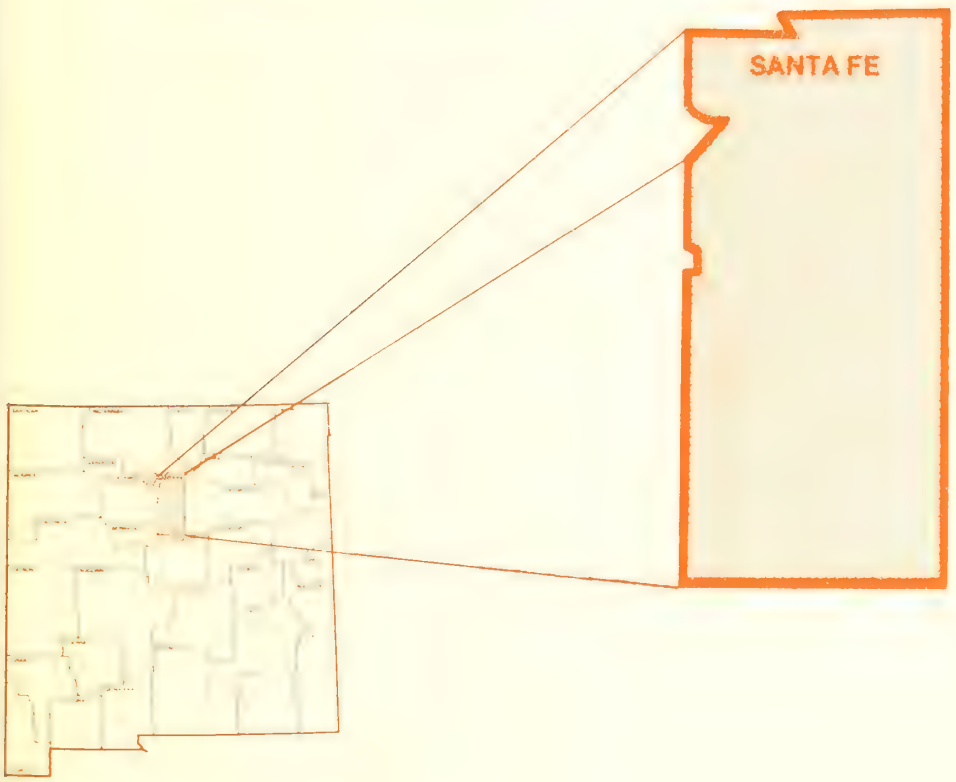

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Dorothy G. Shupe
and
Michael K. Barrett

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Forest Service
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RESEARCH SUMMARY

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

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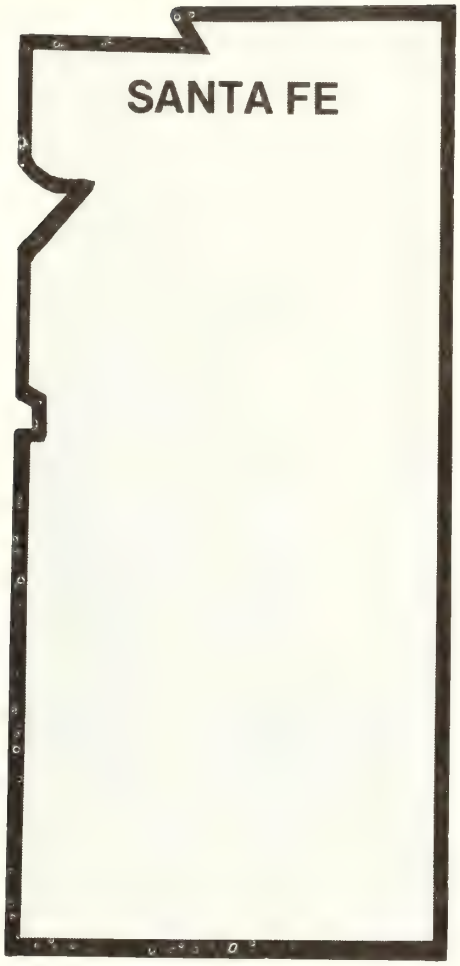

Santa Fe County

INTRODUCTION

A comprehensive timber resource study was conducted on State and private lands in Santa Fe County, New Mexico (fig. 1) from 1974 to 1975 by the New Mexico Department of State Forestry in cooperation with the Division of State and Private Forestry, Forest Service, Region 3, and the Intermountain Forest and Range Experiment Station.

The total land area is 1,215,076 acres (491,726 hectares). The Forest Service administers 250,474 acres (101,364 hectares); the Bureau of Land Management administers 73,250 acres (29,643 hectares), and 79,327 acres (32,103 hectares) are Indian lands. The remaining lands are State owned, 90,500 acres (36,624 hectares), public owned, 9,000 acres (3,642 hectares), and privately owned, 712,525 acres (288,350 hectares). The data presented here are for State, private, and other lands (miscellaneous Federal, and County and municipal lands).

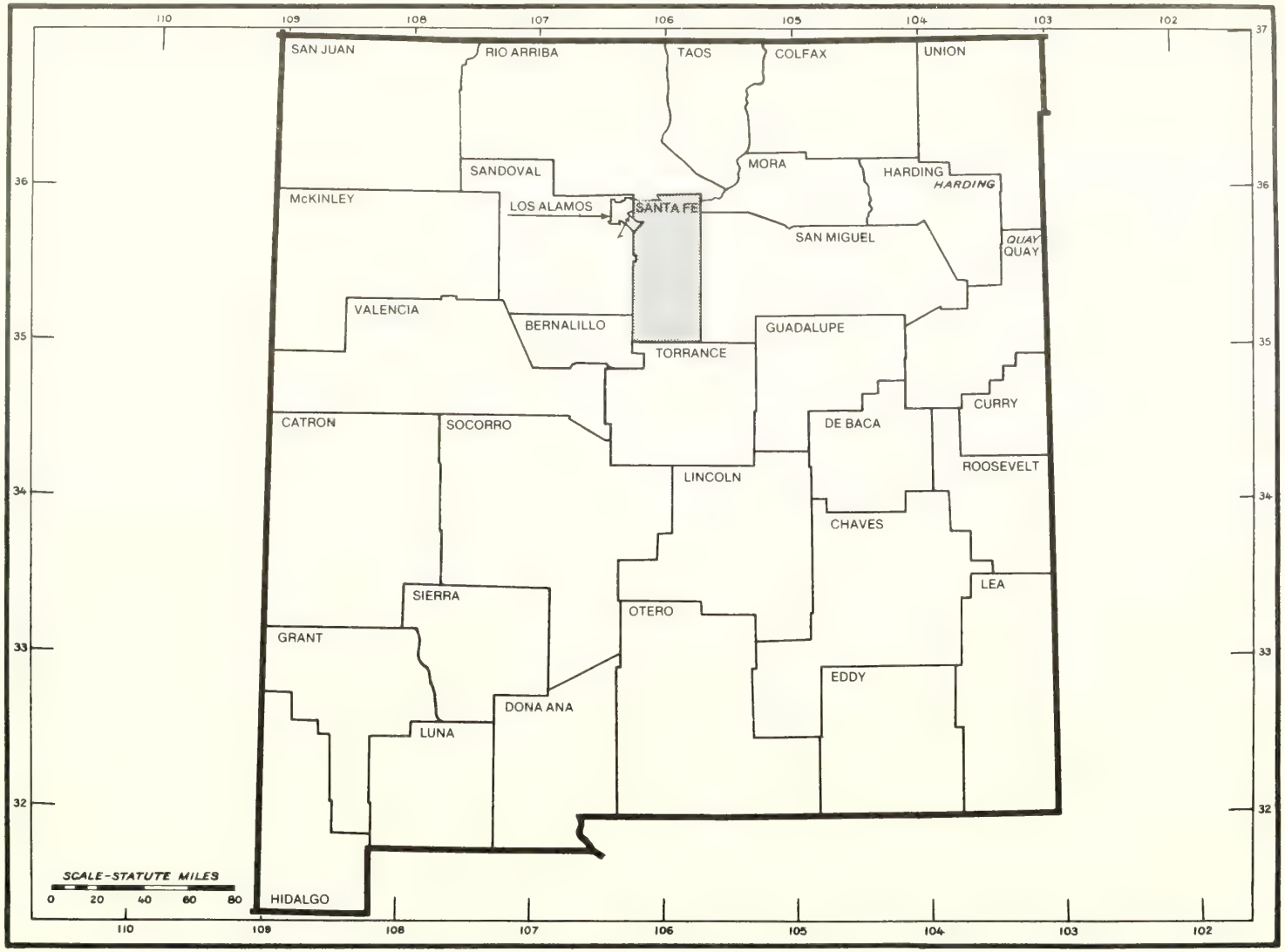

Figure 1.--Santa Fe County, New Mexico.

HIGHLIGHTS

Area

- The forest land area is 298,747 acres (120,900 hectares), or 37 percent of the total State and private land area and 25 percent of the total land area in the County.

- Of the forest land, 13,195 acres (5,340 hectares), or 4.4 percent is classified as commercial timberland.

- Private ownership accounts for 12,599 acres (5,099 hectares), or 95.5 percent, of the commercial timberland.

- The predominant forest types are pinyon-juniper[1] and ponderosa pine which occupy 93.4 percent of the commercial timberland. The remaining area contains Douglas-fir, white fir, and mixed hardwoods forest types.

- Sixty percent of the commercial timberland supports sawtimber stands. Poletimber stands make up 17 percent; the remainder is in sapling and seedling stands or nonstocked.

- More than 88 percent of the commercial timberland is in the 20 to 49 cubic-foot site class, 95 percent of which is privately owned.

Inventory

- Growing stock volume amounts to 5,742 thousand cubic feet (163 thousand cubic meters). The major portion, 85 percent, is in softwood sawtimber trees.

- Rough, rotten, and salvable dead trees comprise 392 thousand cubic feet (11 thousand cubic meters), or 6 percent, of the total sound wood volume.

- About 94 percent of the 25,270 thousand board feet[2] of sawtimber volume is in sawtimber trees less than 23 inches d.b.h.

- Softwood species, ponderosa pine (73 percent), and pinyon and juniper (almost 12 percent), make up about 85 percent of the growing stock volume and 88 percent of the sawtimber volume. Species sharing the remaining percentage are Douglas-fir, white fir, limber pine, and mixed hardwoods.

- Private owners control 96 percent of the softwood growing stock volume and 96 percent of the softwood sawtimber volume.

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[1]The area occupied by pinyon-juniper forest type classified as commercial is so classified because the site index for other associated species on these stands (usually ponderosa pine or Douglas-fir) is high enough to indicate a potential productivity level exceeding 20 cubic feet per acre per year average annual growth, and nonstockable indicators are not present in sufficient quantities to lower yield capability below 20 cubic feet per acre per year. Although pinyon/juniper usually occurs on unproductive forest land, when it occurs in mixtures with other species on productive sites, it is reported in the commercial timberland statistics.

[2]International 1/4-inch rule.

Growth and Mortality

- Net annual growth of growing stock totaled 97,232 cubic feet (2,753 cubic meters) with 99.6 percent occurring in softwood species, mainly ponderosa pine. Growth and mortality were not measured for pinyon and juniper trees.

- About 96 percent of the total net growth is on private lands.

- The annual mortality of 11,256 cubic feet (319 cubic meters) offset 10 percent of the gross annual growth. Causes of mortality are mostly unknown.

DATA RELIABILITY

Individual cells within tables should be used with caution. Some are based on very small sample sizes, and so result in high sampling errors. The standard error percents shown in tables 1 and 2 were calculated at the 67 percent confidence level.

Table 1.--*Area of forest land and percent standard error for Santa Fe County, 1975*

Item	Softwood types		Hardwood types		All types	
	Acres	Percent standard error	Acres	Percent standard error	Acres	Percent standard error
Commercial timberland	13,092	14.7	103	[1]100.0	13,195	14.7
Productive reserved	136	73.3	5	[1]100.0	141	73.3
Other forest land	282,186	1.6	3,225	18.1	285,411	1.6

Table 2.--*Net volume and net annual growth and annual mortality of growing stock and sawtimber on commercial timberland, with percent standard error for Santa Fe County, 1975*

Item	Softwoods		Hardwoods		All species	
	Volume	Percent standard error	Volume	Percent standard error	Volume	Percent standard error
Net volume:						
Growing stock (M cubic feet)	5,729,535	17.2	12,229	[1]100.0	5,741,764	17.2
Sawtimber (M board feet[2])	25,201,942	18.0	68,291	[1]100.0	25,270,233	18.0
Net annual growth:						
Growing stock (cubic feet)	96,843	17.7	389	[1]100.0	97,232	17.7
Sawtimber (board feet[2])	456,232	20.2	2,418	[1]100.0	458,650	20.2
Annual mortality:						
Growing stock (cubic feet)	11,256	84.0	--	0	11,256	84.0
Sawtimber (board feet[2])	65,532	86.5	--	0	65,532	86.5

[1]Computed standard error exceeds 100 percent.

[2]International 1/4-inch rule.

TERMINOLOGY AND DATA TABLES

The following terminology section contains definitions that are relevant to the timber resource data presented in this resource bulletin. Forest area and timber resource data for Santa Fe County, New Mexico, are displayed in tables 3 through 23.

TERMINOLOGY

Land

Bureau of the Census.--The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds less than 40 acres in area.

Water

Census water.--As defined by the Bureau of the Census: streams, sloughs, estuaries, and canals more than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds more than 40 acres in area.

Noncensus water.--The same as defined by the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Land Use Classes

Forest land.--Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Commercial timberland.--Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Productive-reserved forest land.--Forest land sufficiently productive to qualify as commercial timberland, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Other forest land.--(1) Forest land incapable of producing 20 cubic feet per acre of industrial wood under management, because of adverse site conditions; (2) unproductive-reserved forest land.

Nonforest land.--Land that has never supported forests and lands formerly forested where use for timber management is precluded by development for other uses.

Public Ownership Classes

National Forest land.--Federal lands legally designated as National Forest or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands.--Federal lands administered by the Bureau of Land Management.

Indian lands.--Tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

State lands.--Lands owned by States, or lands leased to these governmental units for 50 years or more.

Private Ownership Classes

Miscellaneous Federal lands.--Federal lands other than the following (1) National Forest lands; (2) lands administered by the Bureau of Land Management; and (3) Indian lands.

County and municipal lands.--Lands owned by counties and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Forest industry lands.--Lands owned by companies or individuals operating wood-using plants.

Farmer-owned lands.--Lands owned by farm operators. (Note: These exclude lands leased by farm operators from nonfarm owners, such as railroad companies and States.)

Miscellaneous private lands.--Privately owned lands other than forest industry and farmer-owned lands.

Forest Type and Tree Species

Forest types.--A classification of forest land based upon the species forming a plurality of live-tree stocking.

Forest trees.--Woody plants having a well-developed stem and usually more than 12 feet in height at maturity.

Commercial species.--Tree species presently or prospectively suitable for industrial wood products.

Softwoods.--Coniferous trees, usually evergreen, having needles or scalelike leaves.

Hardwoods.--Dicotyledonous trees, usually broad-leaved and deciduous.

Area Condition Classes

Stocking.--Stocking is an effort to express the extent to which growing space is effectively utilized by present or potential growing stock trees of commercial species. "Percent of stocking" is synonymous with "percentage of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

"Stocking percentages" express current area occupancy in relation to specified standards for full stocking based on number, size, and spacing of trees considered necessary to fully utilize the forest land.

Full utilization of the site is assumed to occur over a range of basal area. As an interim guide, 60 percent of the normal yield table values has been used to establish the lower limit of this range, which represents full-site occupancy. This is called 100 percent stocking. The upper limit of full stocking has been set at 132 percent. Sites with less than 100-percent stocking represent understocking. Overstocking is characterized by sites with over 133 percent stocking.

Class 10.--Area fully stocked (100-132 percent) with desirable trees and not overstocked (133 percent or more).

Class 20.--Area fully stocked with desirable trees, but overstocked with all live trees.

Class 30.--Areas medium to fully stocked (60-99 percent) with desirable trees and with less than 30 percent of the area controlled by other trees and (or) inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

Class 40.--Areas medium to fully stocked with desirable trees and with 30 percent or more of the area controlled by other trees and (or) conditions that ordinarily prevent occupancy by desirable trees.

Class 50.--Areas poorly stocked (16.7-59 percent) with desirable trees, but fully stocked with growing stock trees.

Class 60.--Areas poorly stocked with desirable trees, but with medium to full stocking of growing stock trees.

Class 70.--Areas nonstocked (less than 16.7 percent) or poorly stocked with desirable trees, and poorly stocked with growing stock trees.

Class 80.--Low-risk old-growth stands.

Class 90.--High-risk old-growth stands.

Nonstocked.--Areas less than 16.7 percent stocked with growing stock trees.

Class of Timber

Growing stock trees.--Live trees of commercial species qualifying as desirable or acceptable trees. (Note: Excludes rough, rotten, and dead trees.)

Desirable trees.--Growing stock trees of commercial species (a) having no serious defect in quality, limiting present or prospective use for timber products; (b) of relatively high vigor; and (c) containing no pathogens that may result in death or serious deterioration before rotation age.

Acceptable trees.--Growing stock trees of commercial species that meet specified standards of size and quality, but not qualifying as desirable trees.

Rough trees.--(1) Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of roughness or poor form; (2) all live trees of noncommercial species.

Rotten trees.--Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume (cubic-foot basis) in a tree is rotten.

Cull.--Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Salvable dead trees.--Standing or down dead trees that are considered merchantable by Rocky Mountain Regional standards.

Mortality trees.--Trees formerly growing stock dying from natural causes during a specified period, usually 1 year.

Saw-log portion.--That part of the bole of sawtimber trees between the stump and the saw-log top. A 1-foot stump is used.

Upper-stem portion.--That part of the bole of sawtimber trees above the saw-log top to a minimum top diameter of 4.0-inches outside bark or to the point where the central stem breaks into limbs, whichever occurs first.

Tree Size Classes

Seedlings.--Live trees less than 1.0 inch in diameter at breast height.

Saplings.--Trees 1.0-4.9 inches in diameter at breast height.

Poletimber trees.--Trees at least 5.0 inches in d.b.h., but smaller than sawtimber size.

Sawtimber trees.--Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches, and 11.0 inches for hardwoods.

Volume

Net volume.--Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Growing stock volume.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

Sawtimber volume.--Net volume in board feet of sawtimber trees of commercial species. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

Growth and Mortality

Net annual growth.--The increase in net growing stock volume of a specified size class for a specific year. (Note: Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus net volume of trees reaching the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten trees during the year.)

Mortality.--Number or sound-wood volume of growing stock trees dying from natural causes during a specified period.

Site

Site class.--A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean net annual growth of growing stock (not including thinnings or mortality loss) attainable at culmination of mean net annual growth over age. Height-age relationships are usually used as indicators of the specified volume-site class.

Stand-Size Classes

Sawtimber stands.--Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.--Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and (or) sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.--Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and (or) seedlings.

Nonstocked land.--Commercial timberland less than 16.7 percent stocked with growing stock trees.

FOREST SURVEY TABLES

Table 3.--*Total area in Santa Fe County by ownership class, 1975*

Ownership class	Acres	Hectares
National Forest	250,474	101,364
Bureau of Land Management	73,250	29,643
Indian	79,327	32,103
State	90,500	36,624
Private and other	721,525	291,992
Total land area	1,215,076	491,726
Census water	6,684	2,705
Gross area[1]	1,221,760	494,431

[1]U.S. Bureau of the Census, land and water area of the United States, 1970.

Table 4.--*Land area in Santa Fe County by major land class and ownership class, 1975*

Land class	Ownership class			
	State		Private	
	Acres	Hectares	Acres	Hectares
Commercial timberland	596	241	12,599	5,099
Productive reserved	141	57	--	--
Other forest land:				
Unproductive reserved	51	21	--	--
Unproductive nonreserved	16,706	6,761	268,654	108,721
Total forest land	17,494	7,080	281,253	113,820
Nonforest land	73,006	29,544	440,272	178,172
Total land area	90,500	36,624	721,525	291,992

Table 5.--*Area of commercial timberland in Santa Fe County by forest type, stand-size class, and site class, State owned, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	--	--	38	38
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	38	38
Ponderosa pine:						
Sawtimber	--	--	--	26	112	138
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	48	48
Nonstocked	--	--	--	--	--	--
Total	--	--	--	26	160	186
Pinyon-juniper:						
Sawtimber	--	--	--	--	154	154
Poletimber	--	--	--	--	78	78
Sapling and seedling	--	--	--	--	76	76
Nonstocked	--	--	--	--	64	64
Total	--	--	--	--	372	372
All types:						
Sawtimber	--	--	--	26	304	330
Poletimber	--	--	--	--	78	78
Sapling and seedling	--	--	--	--	124	124
Nonstocked	--	--	--	--	64	64
Total	--	--	--	26	570	596

Table 6.--*Area of commercial timberland in Santa Fe County by forest type, stand-size class, and site class, private owned, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	--	243	172	415
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	206	206
Nonstocked	--	--	--	--	--	--
Total	--	--	--	243	378	621
Ponderosa pine:						
Sawtimber	--	--	--	1,131	3,100	4,231
Poletimber	--	--	--	--	102	102
Sapling and seedling	--	--	--	--	223	223
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,131	3,425	4,556
White fir:						
Sawtimber	--	--	--	--	103	103
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	103	103
Pinyon-juniper:						
Sawtimber	--	--	--	123	2,671	2,794
Poletimber	--	--	--	--	2,081	2,081
Sapling and seedling	--	--	--	--	1,346	1,346
Nonstocked	--	--	--	--	995	995
Total	--	--	--	123	7,093	7,216
Mixed hardwoods:						
Sawtimber	--	--	--	--	103	103
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	103	103
All types:						
Sawtimber	--	--	--	1,497	6,149	7,646
Poletimber	--	--	--	--	2,183	2,183
Sapling and seedling	--	--	--	--	1,775	1,775
Nonstocked	--	--	--	--	995	995
Total	--	--	--	1,497	11,102	12,599

Table 7.--*Area of commercial timberland in Santa Fe County by forest type, stand-size class, and site class, summary--State and private, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
				Acres		
Douglas-fir:						
Sawtimber	--	--	--	243	210	453
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	206	206
Nonstocked	--	--	--	--	--	--
Total	--	--	--	243	416	659
Ponderosa pine:						
Sawtimber	--	--	--	1,157	3,212	4,369
Poletimber	--	--	--	--	102	102
Sapling and seedling	--	--	--	--	271	271
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,157	3,585	4,742
White fir:						
Sawtimber	--	--	--	--	103	103
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	103	103
Pinyon-juniper:						
Sawtimber	--	--	--	123	2,825	2,948
Poletimber	--	--	--	--	2,159	2,159
Sapling and seedling	--	--	--	--	1,422	1,422
Nonstocked	--	--	--	--	1,059	1,059
Total	--	--	--	123	7,465	7,588
Mixed hardwoods:						
Sawtimber	--	--	--	--	103	103
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	103	103
All types:						
Sawtimber	--	--	--	1,523	6,453	7,976
Poletimber	--	--	--	--	2,261	2,261
Sapling and seedling	--	--	--	--	1,899	1,899
Nonstocked	--	--	--	--	1,059	1,059
Total	--	--	--	1,523	11,672	13,195

Table 8.--*Area of commercial timberland in Santa Fe County by stand volume and ownership class, 1975*

Stand volume per acre[1]	Ownership class		
	State	Private	State and private
	Acres		
Less than 1,500 board feet	332	6,598	6,930
1,500 to 4,999 board feet	226	5,155	5,381
5,000 to 9,999 board feet	38	846	884
10,000 board feet or more	--	--	--
All classes	596	12,599	13,195

[1]International 1/4-inch rule.

Table 9.--*Area of commercial timberland in Santa Fe County by forest type and area condition class; State and private, 1975*

Forest type	Area condition class									Nonstocked	All classes	
	10	20	30	40	50	60	70	80	90			
	Acres											*Hectares*
Douglas-fir	--	--	102	--	122	122	313	--	--	--	659	266
Ponderosa pine	--	--	108	--	--	1,869	1,570	--	1,195	--	4,742	1,919
White fir	--	--	--	--	--	--	103	--	--	--	103	42
Pinyon-juniper	--	--	--	--	--	3,442	2,004	--	1,083	1,059	7,588	3,071
Total softwoods	--	--	210	--	122	5,433	3,990	--	2,278	1,059	13,092	5,298
Mixed hardwoods	--	--	--	--	--	--	103	--	--	--	103	42
All types	--	--	210	--	122	5,433	4,093	--	2,278	1,059	13,195	5,340

Table 10.--*Area of productive reserved and other forest land in Santa Fe County by land class, ownership class, and forest type; State and private, 1975*

Land class	Forest type							
	Douglas-fir	Ponderosa pine	Spruce-fir	Pinyon-juniper	Mixed softwoods	Mixed hardwoods	All types	
	Acres							*Hectares*
Productive reserved area:								
State	13	85	5	33	--	5	141	57
Private	--	--	--	--	--	--	--	--
Other forest land area:								
Unproductive nonreserved:								
State	--	--	--	16,593	--	113	16,706	6,761
Private	--	--	--	263,235	2,307	3,112	268,654	108,721
Unproductive reserved:								
State	--	--	--	51	--	--	51	21
Private	--	--	--	--	--	--	--	--
Total all areas:								
State	13	85	5	16,677	--	118	16,898	6,839
Private	--	--	--	263,235	2,307	3,112	268,654	108,721
Total acres	13	85	5	279,912	2,307	3,230	285,552	115,560
Total hectares	5	35	2	113,277	934	1,307	--	115,560

Table 11.--*Number of growing stock trees on commercial timberland in Santa Fe County by species and diameter class; State and private, 1975*

Species	Diameter class (inches at breast height)															
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Trees															
Douglas-fir	81,930	36,861	37,569	19,547	15,432	6,891	3,955	3,756	1,304	192	357	--	112	--	--	207,906
Ponderosa pine	184,865	172,138	107,629	83,461	74,334	55,636	27,532	37,360	14,423	9,606	3,391	705	1,006	285	528	772,899
Limber pine	3,077	7,290	--	1,236	1,302	--	--	--	227	--	--	--	--	--	--	13,132
White fir	97,031	46,556	1,895	7,930	4,989	1,781	3,539	2,503	1,579	--	301	--	143	199	--	168,446
Pinyon-juniper	416,561	287,020	163,045	64,367	29,076	15,603	8,799	2,979	305	--	--	--	--	--	--	987,755
Total softwoods	783,464	549,865	310,138	176,541	125,133	79,911	43,825	46,598	17,838	9,798	4,049	705	1,261	484	528	2,150,138
Mixed hardwoods	--	--	--	--	--	--	521	--	--	--	--	--	--	--	--	521
Total hardwoods	--	--	--	--	--	--	521	--	--	--	--	--	--	--	--	521
All species	783,464	549,865	310,138	176,541	125,133	79,911	44,346	46,598	17,838	9,798	4,049	705	1,261	484	528	2,150,659

Table 12.--*Number of cull and salvable dead trees on commercial timberland in Santa Fe County by ownership class, and softwoods and hardwoods, 1975*

Ownership class and species group	Cull trees			Salvable dead trees
	Sound	Rotten	Total	
	Trees			
State:				
Softwoods	83,048	2,941	85,989	90
Hardwoods	--	--	--	--
Total	83,048	2,941	85,989	90
Private:				
Softwoods	1,500,184	42,842	1,543,026	2,128
Hardwoods	26,196	6,881	33,077	--
Total	1,526,380	49,723	1,576,103	2,128
State and private:				
Softwoods	1,583,232	45,783	1,629,015	2,218
Hardwoods	26,196	6,881	33,077	--
Total	1,609,428	52,664	1,662,092	2,218

Table 13.--*Net volume of growing stock on commercial timberland in Santa Fe County by ownership class, forest type, and stand-size class, 1975*

Ownership class	Forest type	Stand-size class				All classes	
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked		
		Cubic feet					*Cubic meters*
State:							
	Douglas-fir	23,463	--	--	--	23,463	664
	Ponderosa pine	128,667	--	17,233	--	145,900	4,132
	Pinyon-juniper	44,456	10,471	6,112	3,485	64,524	1,827
	All types	196,586	10,471	23,345	3,485	233,887	6,623
Private:							
	Douglas-fir	392,484	--	17,471	--	409,955	11,609
	Ponderosa pine	3,577,210	55,390	81,108	--	3,713,708	105,160
	White fir	61,896	--	--	--	61,896	1,753
	Pinyon-juniper	807,507	295,899	140,192	60,542	1,304,140	36,929
	Mixed hardwoods	18,178	--	--	--	18,178	515
	All types	4,857,275	351,289	238,771	60,542	5,507,877	155,966
State and private:							
	Douglas-fir	415,947	--	17,471	--	433,418	12,273
	Ponderosa pine	3,705,877	55,390	98,341	--	3,859,608	109,292
	White fir	61,896	--	--	--	61,896	1,753
	Pinyon-juniper	851,963	306,370	146,304	64,027	1,368,664	38,756
	Mixed hardwoods	18,178	--	--	--	18,178	515
	All types	5,053,861	361,760	262,116	64,027	5,741,764	162,589

Table 14.--*Net volume of sawtimber on commercial timberland in Santa Fe County by ownership class, forest type, and stand-size class, 1975*

Ownership class	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked	
		Board feet[1]				
State:						
	Douglas-fir	77,404	--	--	--	77,404
	Ponderosa pine	546,938	--	79,602	--	626,540
	Pinyon-juniper	215,818	22,799	34,351	13,967	286,935
	All types	840,160	22,799	113,953	13,967	990,879
Private:						
	Douglas-fir	1,540,071	--	43,537	--	1,583,608
	Ponderosa pine	16,171,255	148,538	374,653	--	16,694,446
	White fir	231,571	--	--	--	231,571
	Pinyon-juniper	3,924,016	686,596	812,552	280,861	5,704,025
	Mixed hardwoods	65,704	--	--	--	65,704
	All types	21,932,617	835,134	1,230,742	280,861	24,279,354
State and private:						
	Douglas-fir	1,617,475	--	43,537	--	1,661,012
	Ponderosa pine	16,718,193	148,538	454,255	--	17,320,986
	White fir	231,571	--	--	--	231,571
	Pinyon-juniper	4,139,834	709,395	846,903	294,828	5,990,960
	Mixed hardwoods	65,704	--	--	--	65,704
	All types	22,772,777	857,933	1,344,695	294,828	25,270,233

[1]International 1/4-inch rule.

Table 15.--*Net volume of growing stock on commercial timberland in Santa Fe County by species and diameter class; State and private, 1975*

Species	Diameter class (inches at breast height)													
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Cubic feet													
Douglas-fir	58,364	75,357	105,383	70,612	66,802	87,483	41,330	9,903	11,634	--	5,958	--	--	532,826
Ponderosa pine	123,324	277,632	532,347	596,763	469,612	899,927	495,313	373,576	179,545	45,128	93,230	28,831	73,258	4,188,486
Limber pine	--	4,171	8,401	--	--	--	7,865	--	--	--	--	--	--	20,437
White fir	3,671	30,737	39,698	19,462	62,718	61,189	54,437	--	15,912	--	10,801	14,832	--	313,457
Pinyon-juniper	153,547	136,925	123,342	112,658	94,535	47,914	5,408	--	--	--	--	--	--	674,329
Total softwoods	338,906	524,822	809,171	799,495	693,667	1,096,513	604,353	383,479	207,091	45,128	109,989	43,663	73,258	5,729,535
Mixed hardwoods	--	--	--	--	12,229	--	--	--	--	--	--	--	--	12,229
Total hardwoods	--	--	--	--	12,229	--	--	--	--	--	--	--	--	12,229
All species	338,906	524,822	809,171	799,495	705,896	1,096,513	604,353	383,479	207,091	45,128	109,989	43,663	73,258	5,741,764

Table 16.--*Net volume of sawtimber on commercial timberland in Santa Fe County by species and diameter class; State and private, 1975*

Species	Diameter class (inches at breast height)											
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Board feet, International 1/4-inch rule											
Douglas-fir	326,575	288,902	326,939	455,701	223,709	55,062	66,163	--	34,437	--	--	1,777,488
Ponderosa pine	1,982,759	2,742,964	2,433,306	4,983,868	2,841,668	2,190,760	1,070,143	274,249	563,632	175,788	452,636	19,711,773
Limber pine	31,075	--	--	--	39,965	--	--	--	--	--	--	71,040
White fir	156,000	85,085	287,188	278,057	239,509	--	63,838	--	42,234	58,145	--	1,210,056
Pinyon-juniper	649,654	807,573	639,869	301,134	33,355	--	--	--	--	--	--	2,431,585
Total softwoods	3,146,063	3,924,524	3,687,302	6,018,760	3,378,206	2,245,822	1,200,144	274,249	640,303	233,933	452,636	25,201,942
Mixed hardwoods	--	--	68,291	--	--	--	--	--	--	--	--	68,291
Total hardwoods	--	--	68,291	--	--	--	--	--	--	--	--	68,291
All species	3,146,063	3,924,524	3,755,593	6,018,760	3,378,206	2,245,822	1,200,144	274,249	640,303	233,933	452,636	25,270,233

Table 17.--*Net volume of growing stock and sawtimber on commercial timberland in Santa Fe County by ownership class and species, 1975*

Ownership class	Species						All species
	Douglas-fir	Ponderosa pine	Limber pine	White fir	Pinyon/juniper	Mixed hardwoods	
	GROWING STOCK *Cubic feet*						
State	26,456	173,313	--	1,893	30,082	2,143	233,887
Private	506,370	4,015,173	20,437	311,564	644,247	10,086	5,507,877
Total	532,826	4,188,486	20,437	313,457	674,329	12,229	5,741,764
	GROWING STOCK *Cubic meters*						
State	749	4,908	--	54	852	60	6,623
Private	14,339	113,697	579	8,822	18,243	286	155,966
Total	15,088	118,605	579	8,876	19,095	346	162,589
	SAWTIMBER *Board feet, International 1/4-inch rule*						
State	65,903	802,842	--	7,401	102,766	11,967	990,879
Private	1,711,585	18,908,931	71,040	1,202,655	2,328,819	56,324	24,279,354
Total	1,777,488	19,711,773	71,040	1,210,056	2,431,585	68,291	25,270,233

in Santa Fe County by class of timber, and softwoods and hardwoods; State and private, 1975

Class of timber	Softwoods	Hardwoods	All classes
		Cubic feet	
Sawtimber trees:			
Saw-log portion	4,645,861	11,727	4,657,588
Upper-stem portion	219,946	502	220,448
Total	4,865,807	12,229	4,878,036
Poletimber trees	863,728	--	863,728
All growing stock trees	5,729,535	12,229	5,741,764
Sound cull trees	277,277	12,815	290,092
Rotten cull trees	34,481	2,677	37,158
Salvable dead trees	64,858	--	64,858
All timber	6,106,151	27,721	6,133,872

Table 19.--*Net volume of growing stock on commercial timberland in Santa Fe County by forest type and species; State and private, 1975*

Forest type	Species								All species	
	Douglas-fir	Ponderosa pine	Limber pine	White fir	Pinyon/ juniper	Total softwoods	Mixed hardwoods	Total hardwoods		
	Cubic feet									*Cubic meters*
Douglas-fir	148,917	177,256	12,573	94,672	--	433,418	--	--	433,418	12,273
Ponderosa pine	318,619	3,183,737	7,864	190,197	146,962	3,847,379	12,229	12,229	3,859,608	109,292
White fir	10,648	22,660	--	28,588	--	61,896	--	--	61,896	1,753
Pinyon-juniper	54,642	788,626	--	--	525,396	1,368,664	--	--	1,368,664	38,756
Total softwoods	532,826	4,172,279	20,437	313,457	672,358	5,711,357	12,229	12,229	5,723,586	162,074
Mixed hardwoods	--	16,207	--	--	1,971	18,178	--	--	18,178	515
Total hardwoods	--	16,207	--	--	1,971	18,178	--	--	18,178	515
All types	532,826	4,188,486	20,437	313,457	674,329	5,729,535	12,229	12,229	5,741,764	162,589
	Cubic meters									
All types	15,088	118,605	579	8,876	19,095	162,243	346	346	--	162,589

Table 20.--*Net volume of sawtimber on commercial timberland in Santa Fe County by forest type and species; State and private, 1975*

Forest type	Species								All species
	Douglas-fir	Ponderosa pine	Limber pine	White fir	Pinyon/ juniper	Total softwoods	Mixed hardwoods	Total hardwoods	
	Board feet, International 1/4-inch rule								
Douglas-fir	416,505	803,201	57,084	384,222	--	1,661,012	--	--	1,661,012
Ponderosa pine	1,108,247	14,956,777	13,956	697,940	475,775	17,252,695	68,291	68,291	17,320,986
White fir	12,025	91,652	--	127,894	--	231,571	--	--	231,571
Pinyon-juniper	240,711	3,794,439	--	--	1,955,810	5,990,960	--	--	5,990,960
Total softwoods	1,777,488	19,646,069	71,040	1,210,056	2,431,585	25,136,238	68,291	68,291	25,204,529
Mixed hardwoods	--	65,704	--	--	--	65,704	--	--	65,704
Total hardwoods	--	65,704	--	--	--	65,704	--	--	65,704
All types	1,777,488	19,711,773	71,040	1,210,056	2,431,585	25,201,942	68,291	68,291	25,270,233

Table 21.--*Net annual growth of growing stock and sawtimber on commercial timberland in Santa Fe County by ownership class and species, 1975*

Ownership class	Species					
	Douglas-fir	Ponderosa pine	Limber pine	White fir	Mixed hardwoods	All species
	GROWING STOCK *Cubic feet*					
State	770	3,085	--	27	68	3,950
Private	12,507	73,453	342	6,659	321	93,282
Total	13,277	76,538	342	6,686	389	97,232
	GROWING STOCK *Cubic meters*					
State	22	87	--	1	2	112
Private	354	2,080	10	188	9	2,641
Total	376	2,167	10	189	11	2,753
	SAWTIMBER *Board feet, International 1/4-inch rule*					
State	2,241	17,513	--	106	424	20,284
Private	59,102	332,436	1,327	43,507	1,994	438,366
Total	61,343	349,949	1,327	43,613	2,418	458,650

Table 22.--*Annual mortality of growing stock and sawtimber on commercial timberland in Santa Fe County by ownership class, and softwoods and hardwoods, 1975*

Species group and ownership class	Growing stock		Sawtimber
	- Cubic feet-	*- Cubic meters -*	*- Board feet*[1] *-*
Softwoods:			
State	477	14	2,264
Private	10,779	305	63,268
Total	11,256	319	65,532
Hardwoods:			
State	--	--	--
Private	--	--	--
Total	--	--	--

[1]International 1/4-inch rule.

Table 23.--*Annual mortality of growing stock and sawtimber on commercial timberland in Santa Fe County by cause of death and species; State and private, 1975*

Cause of death	Species: Ponderosa pine	All species
	GROWING STOCK	
	Cubic feet	
Insects	--	--
Disease	--	--
Fire	--	--
Animal	--	--
Weather	1,673	1,673
Suppression	--	--
Unknown	9,583	9,583
Logging	--	--
Total	11,256	11,256
	GROWING STOCK	
	Cubic meters	
Insects	--	--
Disease	--	--
Fire	--	--
Animal	--	--
Weather	47	47
Suppression	--	--
Unknown	272	272
Logging	--	--
Total	319	319
	SAWTIMBER	
	Board feet, International 1/4-inch rule	
Insects	--	--
Disease	--	--
Fire	--	--
Animal	--	--
Weather	9,717	9,717
Suppression	--	--
Unknown	55,815	55,815
Logging	--	--
Total	65,532	65,532

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Shupe, Dorothy G., and Michael K. Barrett.
1980. Forest area and timber resource statistics for Santa Fe County, New Mexico, 1975. USDA For. Serv. Resour. Bull. INT-16, 24 p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

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KEYWORDS: forest surveys (regional), forest area classification, stand volume.

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The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

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FOREST AREA AND TIMBER RESOURCE STATISTICS FOR SAN MIGUEL COUNTY, NEW MEXICO, 1975

MICHAEL K. BARRETT
and
DOROTHY G. SHUPE

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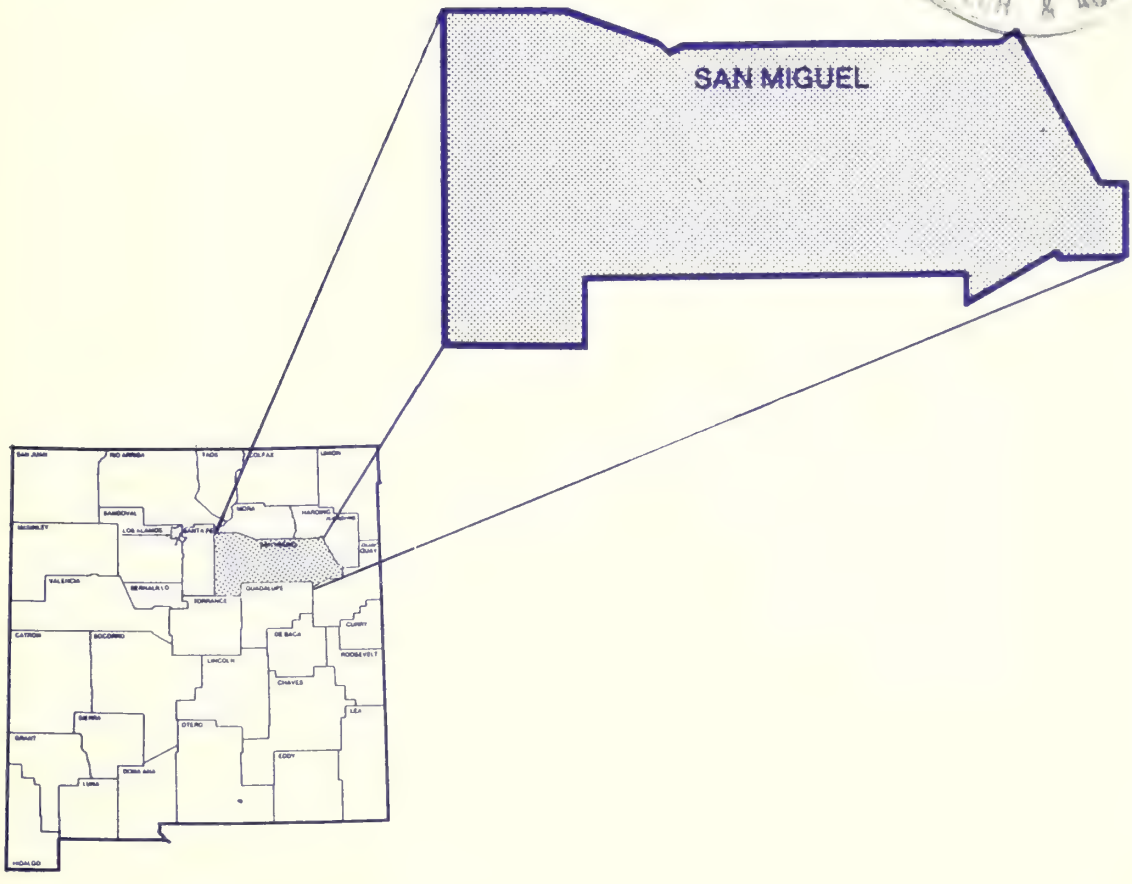

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Michael K. Barrett
and
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INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Forest Service
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Ogden, Utah 84401

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RESEARCH SUMMARY

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

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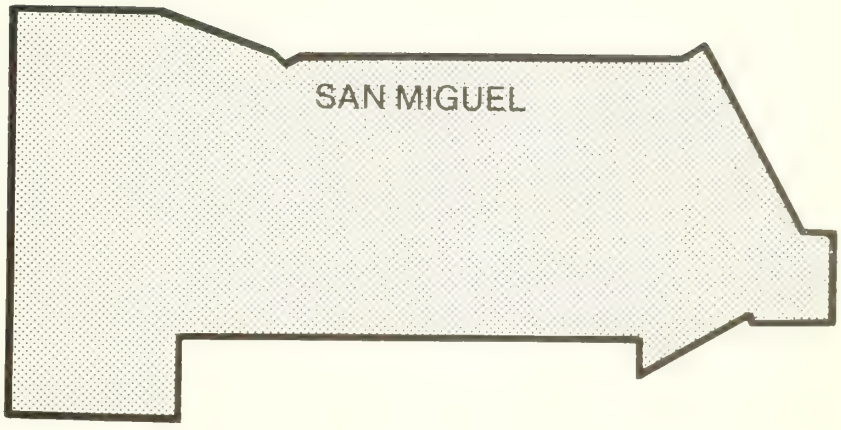
San Miguel County



INTRODUCTION

A comprehensive timber resource study was conducted on State and private lands in San Miguel County, New Mexico (fig. 1), from 1974 to 1975 by the New Mexico Department of State Forestry in cooperation with the Division of State and Private Forestry, Forest Service, Region 3, and the Intermountain Forest and Range Experiment Station.

The total land area in San Miguel County is 3,034,432 acres (1,227,996 hectares). The Forest Service manages 339,018 acres (137,196 hectares) and the Bureau of Land Management 46,488 acres (18,813 hectares). The remaining 2,648,926 acres (1,071,987 hectares) are in State, private, and other ownership. The data presented here are for State, private, and other lands (miscellaneous Federal, and County and municipal lands).

Highlights show the area of commercial timberland in comparison to total forest land area, and the distribution of this area by forest type, stand-size class, and site class. Discussions of the data reliability and terminology are included. These two items should be reviewed carefully when using this information.

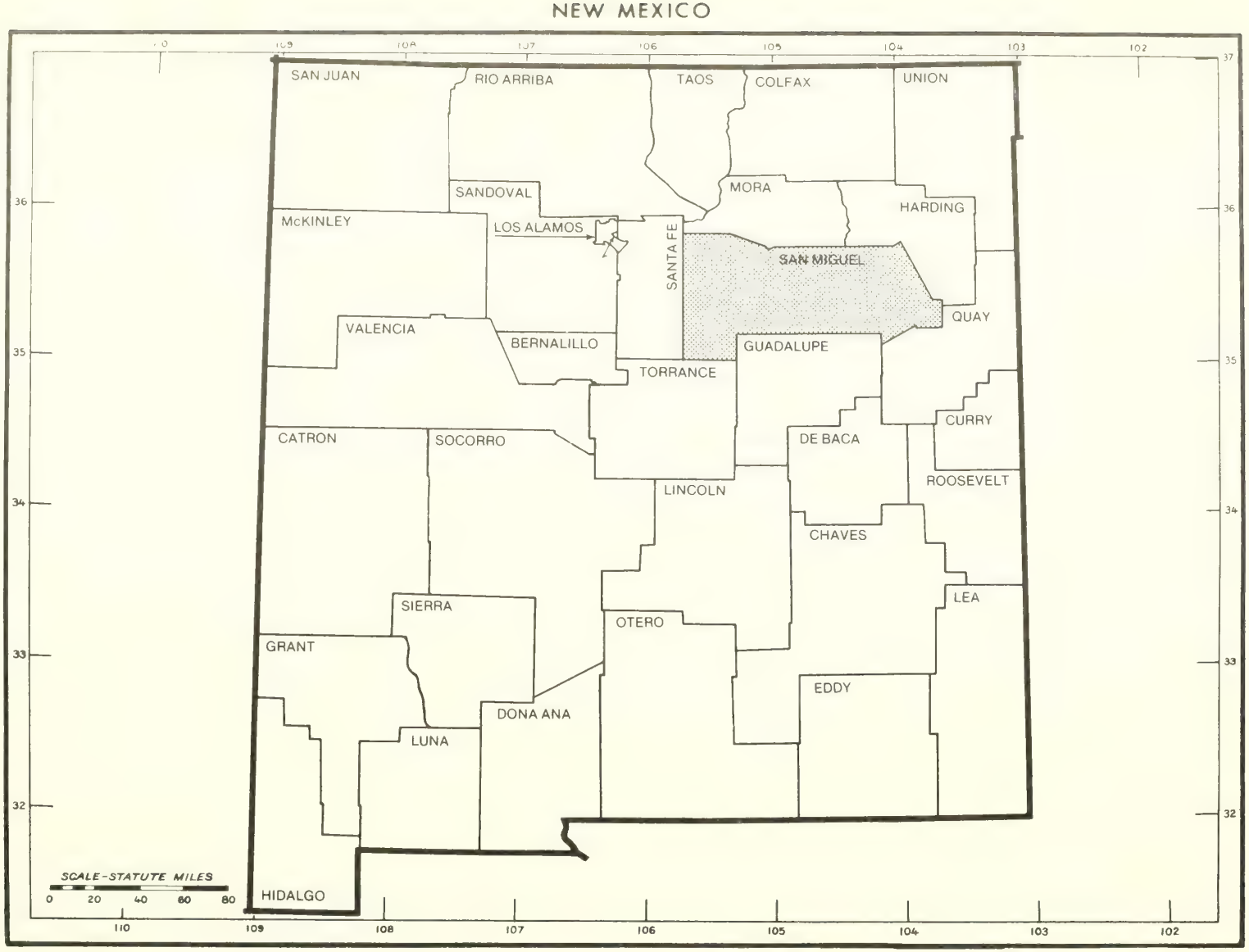


Figure 1.--San Miguel County, New Mexico

HIGHLIGHTS

Area

- The forest land area is 885,815 acres (358,478 hectares), or 33 percent of the total State and private land area in the County.

- Of the forest land, 77,682 acres (31,437 hectares), or 9 percent are classified as commercial timberland.

- Private ownership accounts for 75,436 acres (30,528 hectares), or 97 percent of the commercial timberland.

- The predominant forest type is ponderosa pine, which occupies 71 percent of the commercial timberland. The remaining area consists of Douglas-fir, white fir, pinyon-juniper[1], limber pine, and aspen forest types.

- Seventy-two percent of the commercial timberland is sawtimber stands; pole-timber stands occupy 18 percent; the remaining 10 percent is in sapling and seedling stands or nonstocked.

- Nearly 70 percent of the commercial timberland is in the 20 to 49 cubic-foot productivity class.

Inventory

- Growing stock volume amounts to 64,396 thousand cubic feet (1,823 thousand cubic meters) with the major portion, about 70 percent, in softwood sawtimber trees.

- Rough, rotten, and salvable dead trees comprised 1,901 thousand cubic feet (54 thousand cubic meters), or about 3 percent, of the total sound wood volume.

- About 90 percent of the 217,838 thousand board feet[2] of sawtimber volume is in sawtimber less than 21 inches d.b.h.

- Ponderosa pine and Douglas-fir together make up about 76 percent of the growing stock volume and 79 percent of the sawtimber volume. Species sharing the remaining percentage are white fir, limber pine, Engelmann spruce, subalpine fir, pinyon pine, juniper; aspen and other hardwoods. Pinyon and juniper account for less than two-tenths of 1 percent of the total growing stock volume. Six percent of this pinyon and juniper volume is in State ownership.

- About 97 percent of both the total growing stock volume and the total sawtimber volume is privately owned.

---

[1]The area occupied by pinyon-juniper forest type classified as commercial is so classified because the site index for other associated species on these stands (usually ponderosa pine or Douglas-fir) was high enough to indicate a site potential productivity level exceeding 20 cubic feet per acre per year average annual growth, and nonstockable indicators were not present in sufficient quantities to lower the yield capability below 20 cubic feet per acre per year. Although pinyon/juniper usually occurs on unproductive forest land, when it occurs in mixtures with other species on productive sites, it is reported in the commercial timberland statistics.

[2]International 1/4-inch rule.

Growth and Mortality

- Net annual growth of growing stock totals 1,943,218 cubic feet (55,026 cubic meters) with 86 percent occurring in softwood species; mainly ponderosa pine, Douglas-fir, and white fir. Growth and mortality were not measured for pinyon and juniper trees.

- Almost 98 percent of the total net growth is on private land.

- The annual mortality of 273,179 cubic feet (7,736 cubic meters) offsets 12 percent of the gross annual growth.

- Fire causes 76 percent of the mortality. Weather, disease, suppression, and other unknown factors account for the remainder.

- Nearly 97 percent of the mortality occurs on private lands.

- Nearly 70 percent of the mortality occurs in ponderosa pine.

- Although hardwoods make up only about 7 percent of the total growing stock volume, they account for over 9 percent of the mortality.

DATA RELIABILITY

Individual cells within tables should be used with caution. Some are based on very small sample sizes, and so result in high sampling errors. The standard error percents shown in tables 1 and 2 were calculated at the 67 percent confidence level.

Table 1.--*Area of forest land and percent standard error for San Miguel County, 1975*

Item	Softwood types		Hardwood types		All types	
	Acres	Percent standard error	Acres	Percent standard error	Acres	Percent standard error
Commercial timberland	76,581	7.2	1,101	46.1	77,682	7.2
Other forest land:						
Unproductive reserved	1,763	25.1	--	0	1,763	25.1
Unproductive nonreserved	785,276	10.7	21,094	15.7	806,370	10.4

Table 2.--*Net volume and net annual growth and annual mortality of growing stock and sawtimber on commercial timberland, with percent standard error for San Miguel County, 1975*

Item	Softwoods		Hardwoods		All species	
	Volume	Percent standard error	Volume	Percent standard error	Volume	Percent standard error
Net volume:						
Growing stock (M cubic feet)	60,047	9.1	4,349	32.3	64,396	9.6
Sawtimber (M board feet[1])	211,741	10.2	6,097	48.6	217,838	10.4
Net annual growth:						
Growing stock (cubic feet)	1,667,153	14.8	276,065	47.2	1,943,218	15.1
Sawtimber (board feet[1])	6,886,629	16.4	153,820	[2]100.0	7,040.449	16.7
Annual mortality:						
Growing stock (cubic feet)	247,597	71.0	25,582	77.6	273,179	64.7
Sawtimber (board feet[1])	1,077,008	72.5	141,805	77.4	1,218,813	64.6

[1]International 1/4-inch rule.

[2]Computed standard error exceeds 100 percent.

TERMINOLOGY AND DATA TABLES

The following terminology section contains definitions that are relevant to the timber resource data presented in this resource bulletin. Forest area and timber resource data for San Miguel County, New Mexico, are displayed in tables 3 through 23.

TERMINOLOGY

Land

Bureau of the Census.--The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds less than 40 acres in area.

Water

Census water.--As defined by the Bureau of the Census, streams, sloughs, estuaries, and canals more than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds more than 40 acres in area.

Noncensus water.--The same as defined by the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Land Use Classes

Forest land.--Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Commercial timberland.--Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Productive-reserved forest land.--Forest land sufficiently productive to qualify as commercial timberland, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Other forest land.--(1) Forest land incapable of producing 20 cubic feet per acre of industrial wood under management, because of adverse site conditions; (2) unproductive-reserved forest land.

Nonforest land.--Land that has never supported forests and lands formerly forested where use for timber management is precluded by development for other use.

Public Ownership Classes

National Forest land.--Federal lands legally designated as National Forest or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands.--Federal lands administered by the Bureau of Land Management.

Indian lands.--Tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

State lands.--Lands owned by States, or lands leased to these governmental units for 50 years or more.

Private Ownership Classes

County and municipal lands.--Lands owned by counties and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Forest industry lands.--Lands owned by companies or individuals operating wood-using plants.

Farmer-owned lands.--Lands owned by farm operators. (Note: These exclude lands leased by farm operators from nonfarm owners, such as railroad companies and States.)

Miscellaneous Federal lands.--Federal lands other than the following: (1) National Forest lands; (2) lands administered by the Bureau of Land Management; and (3) Indian lands.

Miscellaneous private lands.--Privately owned lands other than forest industry and farmer-owned lands.

Forest Type and Tree Species

Forest types.--A classification of forest land based upon the species forming a plurality of live-tree stocking.

Forest trees.--Woody plants having a well-developed stem and usually more than 12 feet in height at maturity.

Commercial species.--Tree species presently or prospectively suitable for industrial wood products.

Softwoods.--Coniferous trees, usually evergreen, having needles or scalelike leaves.

Hardwoods.--Dicotyledonous trees, usually broad-leaved and deciduous.

Area Condition Classes

Stocking.--Stocking is an effort to express the extent to which growing space is effectively utilized by present or potential growing stock trees of commercial species. "Percent of stocking" is synonymous with "percentage of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

"Stocking percentages" express current area occupancy in relation to specified standards for full stocking based on number, size, and spacing of trees considered necessary to fully utilize the forest land.

Full utilization of the site is assumed to occur over a range of basal area. As an interim guide, 60 percent of the normal yield table values has been used to establish the lower limit of the range which represents full-site occupancy. This is called 100-percent stocking. The upper limit of full stocking has been set at 132 percent. Sites with less than 100-percent stocking represent understocking with less than full-size occupancy. Overstocking is characterized by sites with over 133-percent stocking.

Class 10.--Area fully stocked (100-132 percent) with desirable trees and not overstocked (133 percent or more).

Class 20.--Area fully stocked with desirable trees, but overstocked with all live trees.

Class 30.--Areas medium to fully stocked (60-99 percent) with desirable trees and with less than 30 percent of the area controlled by other trees and (or) inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

Class 40.--Areas medium to fully stocked with desirable trees and with 30 percent or more of the area controlled by other trees and (or) conditions that ordinarily prevent occupancy by desirable trees.

Class 50.--Areas poorly stocked (16.7-59 percent) with desirable trees, but fully stocked with growing stock trees.

Class 60.--Areas poorly stocked with desirable trees, but with medium to full stocking of growing stock trees.

Class 70.--Areas nonstocked (less than 16.7 percent) or poorly stocked with desirable trees, and poorly stocked with growing stock trees.

Class 80.--Low-risk old-growth stands.

Class 90.--High-risk old-growth stands.

Nonstocked.--Areas less than 16.7 percent stocked with growing stock trees.

Class of Timber

Growing stock trees.--Live trees of commercial species qualifying as desirable or acceptable trees. (Note: Excludes rough, rotten, and dead trees.)

Desirable trees.--Growing stock trees (a) having no serious defect in quality limiting present or prospective use for timber products; (b) of relatively high vigor; and (c) containing no pathogens that may result in death or serious deterioration before rotation age.

Acceptable trees.--Growing stock trees that meet specified standards of size and quality, but not qualifying as desirable trees.

Rough trees.--(1) Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of roughness or poor form; (2) all live trees of non-commercial species.

Rotten trees.--Live trees that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume (cubic-foot basis) in a tree is rotten.

Cull.--Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Salvable dead trees.--Standing or down dead trees that are considered merchantable by Rocky Mountain Regional standards.

Mortality trees.--Trees formerly growing stock dying from natural causes during a specified period, usually 1 year.

Saw-log portion.--That part of the bole of sawtimber trees between the stump and the saw-log top. A 1-foot stump is used.

Upper-stem portion.--That part of the bole of sawtimber trees above the saw-log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs, whichever occurs first.

Tree Size Classes

Seedlings.--Live trees less than 1.0 inch in diameter at breast height.

Saplings.--Trees 1.0-4.9 inches in diameter at breast height.

Poletimber trees.--Trees at least 5.0 inches in d.b.h., but smaller than sawtimber size.

Sawtimber trees.--Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches, and 11.0 inches for hardwoods.

Volume

Net volume.--Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Growing stock volume.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

Sawtimber volume.--Net volume in board feet of sawtimber trees of commercial species. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

Growth and Mortality

Net annual growth.--The increase in net growing stock volume of a specified size class for a specific year. (Note: Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus net volume of trees reaching the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten trees during the year.)

Mortality.--Number or sound-wood volume of growing stock trees dying from natural causes during a specified period.

Site

Site class.--A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean net annual growth of growing stock (not including thinnings or mortality loss) attainable at culmination of mean net annual growth over age. Height-age relationships are usually used as indicators of the specified volume-site class.

Stand-Size Classes

Sawtimber stands.--Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.--Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and (or) sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.--Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and (or) seedlings.

Nonstocked land.--Commercial timberland less than 16.7 percent stocked with growing stock trees.

FOREST SURVEY TABLES

Table 3.--*Total area in San Miguel County by ownership class, 1975*

Ownership class	Acres	Hectares
National Forest	339,018	137,196
Bureau of Land Management	46,488	18,813
State	179,300	72,561
Private and other	2,469,626	999,426
Total land area	3,034,432	1,227,996
Census water	16,512	6,682
Gross area[1]	3,050,944	1,234,678

[1]U.S. Bureau of the Census, land and water area of the United States, 1970.

Table 4.--*Land area in San Miguel County by major land class and ownership class, 1975*

Land class	Ownership class			
	State		Private	
	Acres	Hectares	Acres	Hectares
Commercial timberland	2,246	909	75,436	30,528
Productive reserved	--	--	--	--
Other forest land:				
Unproductive reserved	1,607	650	156	63
Unproductive nonreserved	85,216	34,486	721,154	291,842
Total forest land	89,069	36,045	796,746	322,433
Nonforest land	90,231	36,516	1,672,880	676,993
Total land area	179,300	72,561	2,469,626	999,426

Table 5.--*Area of commercial timberland in San Miguel County by forest type, stand-size class, and site class, State owned, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	19	107	129	255
Poletimber	--	--	--	68	--	68
Sapling and seedling	--	--	--	26	--	26
Nonstocked	--	--	--	--	--	--
Total	--	--	19	201	129	349
Ponderosa pine:						
Sawtimber	--	--	--	324	814	1,138
Poletimber	--	--	--	--	304	304
Sapling and seedling	--	--	--	--	84	84
Nonstocked	--	--	--	--	42	42
Total	--	--	--	324	1,244	1,568
Limber pine:						
Sawtimber	--	--	--	42	--	42
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	42	--	42
White fir:						
Sawtimber	--	--	54	23	23	100
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	54	23	23	100
Pinyon-juniper:						
Sawtimber	--	--	--	--	22	22
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	165	165
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	187	187
Total softwoods:						
Sawtimber	--	--	73	496	988	1,557
Poletimber	--	--	--	68	304	372
Sapling and seedling	--	--	--	26	249	275
Nonstocked	--	--	--	--	42	42
Total	--	--	73	590	1,583	2,246
Aspen:						
Sawtimber	--	--	--	--	--	--
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	--	--
All types:						
Sawtimber	--	--	73	496	988	1,557
Poletimber	--	--	--	68	304	372
Sapling and seedling	--	--	--	26	249	275
Nonstocked	--	--	--	--	42	42
Total	--	--	73	590	1,583	2,246

Table 6.--*Area of commercial timberland in San Miguel County by forest type, stand-size class, and site class, private owned, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
				Acres		
Douglas-fir:						
Sawtimber	--	--	1,174	3,279	4,319	8,772
Poletimber	--	--	--	2,242	--	2,242
Sapling and seedling	--	--	--	1,128	--	1,128
Nonstocked	--	--	--	--	--	--
Total	--	--	1,174	6,649	4,319	12,142
Ponderosa pine:						
Sawtimber	--	--	--	10,868	27,301	38,169
Poletimber	--	--	--	--	11,023	11,023
Sapling and seedling	--	--	--	--	3,340	3,340
Nonstocked	--	--	--	--	1,113	1,113
Total	--	--	--	10,868	42,777	53,645
Limber pine:						
Sawtimber	--	--	--	1,113	--	1,113
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,113	--	1,113
White fir:						
Sawtimber	--	--	2,210	1,053	1,053	4,316
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	2,210	1,053	1,053	4,316
Pinyon-juniper:						
Sawtimber	--	--	--	--	1,041	1,041
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	2,078	2,078
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	3,119	3,119
Total softwoods:						
Sawtimber	--	--	3,384	16,313	33,714	53,411
Poletimber	--	--	--	2,242	11,023	13,265
Sapling and seedling	--	--	--	1,128	5,418	6,546
Nonstocked	--	--	--	--	1,113	1,113
Total	--	--	3,384	19,683	51,268	74,335
Aspen:						
Sawtimber	--	--	--	734	--	734
Poletimber	--	--	--	--	367	367
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	734	367	1,101
All types:						
Sawtimber	--	--	3,384	17,047	33,714	54,145
Poletimber	--	--	--	2,242	11,390	13,632
Sapling and seedling	--	--	--	1,128	5,418	6,546
Nonstocked	--	--	--	--	1,113	1,113
Total	--	--	3,384	20,417	51,635	75,436

Table 7.--*Area of commercial timberland in San Miguel County by forest type, stand-size class, and site class, summary--State and private, 1975*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	1,193	3,386	4,448	9,027
Poletimber	--	--	--	2,310	--	2,310
Sapling and seedling	--	--	--	1,154	--	1,154
Nonstocked	--	--	--	--	--	--
Total	--	--	1,193	6,850	4,448	12,491
Ponderosa pine:						
Sawtimber	--	--	--	11,192	28,115	39,307
Poletimber	--	--	--	--	11,327	11,327
Sapling and seedling	--	--	--	--	3,424	3,424
Nonstocked	--	--	--	--	1,155	1,155
Total	--	--	--	11,192	44,021	55,213
Limber pine:						
Sawtimber	--	--	--	1,155	--	1,155
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,155	--	1,155
White fir:						
Sawtimber	--	--	2,264	1,076	1,076	4,416
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	2,264	1,076	1,076	4,416
Pinyon-juniper:						
Sawtimber	--	--	--	--	1,063	1,063
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	2,243	2,243
Nonstocked	--	--	--	--	--	--
Total	--	--	--	--	3,306	3,306
Total softwoods:						
Sawtimber	--	--	3,457	16,809	34,702	54,968
Poletimber	--	--	--	2,310	11,327	13,637
Sapling and seedling	--	--	--	1,154	5,667	6,821
Nonstocked	--	--	--	--	1,155	1,155
Total	--	--	3,457	20,273	52,851	76,581
Aspen:						
Sawtimber	--	--	--	734	--	734
Poletimber	--	--	--	--	367	367
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	734	367	1,101
All types:						
Sawtimber	--	--	3,457	17,543	34,702	55,702
Poletimber	--	--	--	2,310	11,694	14,004
Sapling and seedling	--	--	--	1,154	5,667	6,821
Nonstocked	--	--	--	--	1,155	1,155
Total	--	--	3,457	21,007	53,218	77,682

Table 8.--*Area of commercial timberland in San Miguel County by stand volume and ownership classes, 1975*

Stand volume per acre[1]	Ownership class		
	State	Private	State and private
	Acres		
Less than 1,500 board feet	1,975	65,858	67,833
1,500 to 4,999 board feet	271	9,578	9,849
5,000 to 9,999 board feet	--	--	--
10,000 board feet or more	--	--	--
All classes	2,246	75,436	77,682

[1]International 1/4-inch rule.

Table 9.--*Area of commercial timberland in San Miguel County by forest type and area condition class; State and private, 1975*

Forest type	Area condition class									Nonstocked	All classes	
	10	20	30	40	50	60	70	80	90			
	Acres											*Hectares*
Douglas-fir	--	--	5,617	--	2,310	3,502	1,062	--	--	--	12,491	5,055
Ponderosa pine	--	--	1,155	--	11,510	24,598	16,795	--	--	1,155	55,213	22,344
Limber pine	--	--	--	--	1,155	--	--	--	--	--	1,155	467
White fir	--	--	1,154	--	1,076	2,186	--	--	--	--	4,416	1,787
Pinyon-juniper	--	--	--	--	--	--	3,306	--	--	--	3,306	1,338
Total softwoods	--	--	7,926	--	16,051	30,286	21,163	--	--	1,155	76,581	30,991
Aspen	--	--	--	--	367	367	367	--	--	--	1,101	446
All types	--	--	7,926	--	16,418	30,653	21,530	--	--	1,155	77,682	31,437

Table 10.--*Area of productive reserved and other forest land in San Miguel County by land class, ownership class, and forest type, 1975*

Land class	Forest type: Ponderosa pine	Pinyon-juniper	Mixed softwoods	Mixed hardwoods	All types	
	Acres					*Hectares*
Productive reserved:						
State	--	--	--	--	--	--
Private	--	--	--	--	--	--
Other forest land:						
Unproductive nonreserved:						
State	42	767	82,949	1,458	85,216	34,486
Private	1,113	16,505	683,900	19,636	721,154	291,842
Unproductive reserved:						
State	--	--	1,607	--	1,607	650
Private	--	--	156	--	156	63
Total land area:						
State	42	767	84,556	1,458	86,823	35,136
Private	1,113	16,505	684,056	19,636	721,310	291,905
Total acres	1,155	17,272	768,612	21,094	808,133	--
Total hectares	467	6,989	311,048	8,537	--	327,041

Table 11.--*Number of growing stock trees on commercial timberland in San Miguel County by species and diameter class; State and private, 1975*

Species	Diameter class (inches at breast height): 1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand trees															
Douglas-fir	2,025	892	595	310	271	131	77	51	16	11	3	3	2	--	1	4,388
Ponderosa pine	5,205	4,071	2,823	2,073	1,185	624	382	136	76	10	12	7	4	--	1	16,609
Limber pine	480	206	109	17	16	19	5	23	11	6	3	2	1	--	--	898
Subalpine fir	--	--	43	30	--	6	--	--	--	2	--	--	--	--	--	81
White fir	2,321	508	313	257	106	79	32	32	26	17	8	2	1	1	1	3,704
Engelmann spruce	68	55	25	19	11	--	12	2	4	1	1	1	--	--	--	199
Pinyon/juniper	--	32	34	29	9	--	--	--	--	--	--	--	--	--	--	104
Total softwoods	10,099	5,764	3,942	2,735	1,598	859	508	244	133	47	27	15	8	1	3	25,983
Aspen	215	225	680	140	68	23	16	6	2	1	--	--	--	--	--	1,376
Other hardwoods	139	236	30	30	--	--	--	--	--	--	--	--	--	--	--	435
Total hardwoods	354	461	710	170	68	23	16	6	2	1	--	--	--	--	--	1,811
All species	10,453	6,225	4,652	2,905	1,666	882	524	250	135	48	27	15	8	1	3	27,794

Table 12.--*Number of cull and salvable dead trees on commercial timberland in San Miguel County by ownership class, and softwoods and hardwoods, 1975*

Ownership class and species group	Cull trees			Salvable dead trees
	Sound	Rotten	Total	
	Thousand trees			
State:				
Softwoods	155	2	157	2
Hardwoods	26	1	27	([1])
Total	181	3	184	2
Private:				
Softwoods	4,083	81	4,164	51
Hardwoods	1,090	76	1,166	4
Total	5,173	157	5,330	55
State and private:				
Softwoods	4,238	83	4,321	53
Hardwoods	1,116	77	1,193	4
Total	5,354	160	5,514	57

[1]Less than 0.5 thousand trees.

Table 13.--*Net volume of growing stock on commercial timberland in San Miguel County by ownership class, forest type, and stand-size class, 1975*

Ownership class	Forest type	Stand-size class				All classes	
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked		
		Thousand cubic feet					*Thousand cubic meters*
State:							
	Douglas-fir	294	81	16	--	391	11
	Ponderosa pine	830	179	26	4	1,039	29
	Limber pine	64	--	--	--	64	2
	White fir	185	--	--	--	185	5
	Pinyon-juniper	9	--	10	--	19	1
	Aspen	--	--	--	--	--	--
	All types	1,382	260	52	4	1,698	48
Private:							
	Douglas-fir	9,730	2,423	720	--	12,873	365
	Ponderosa pine	30,289	6,135	995	116	37,535	1,063
	Limber pine	1,710	--	--	--	1,710	48
	White fir	7,869	--	--	--	7,869	223
	Pinyon-juniper	439	--	124	--	563	15
	Aspen	1,728	420	--	--	2,148	61
	All types	51,765	8,978	1,839	116	62,698	1,775
State and private:							
	Douglas-fir	10,024	2,504	736	--	13,264	376
	Ponderosa pine	31,119	6,314	1,021	120	38,574	1,092
	Limber pine	1,774	--	--	--	1,774	50
	White fir	8,054	--	--	--	8,054	228
	Pinyon-juniper	448	--	134	--	582	16
	Aspen	1,728	420	--	--	2,148	61
	All types	53,147	9,238	1,891	120	64,396	1,823

Table 14.--*Net volume of sawtimber on commercial timberland in San Miguel County by ownership class, forest type, and stand-size class, 1975*

Ownership class	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked	
		Thousand board feet[1]				
State:						
	Douglas-fir	1,060	166	70	--	1,296
	Ponderosa pine	3,129	343	91	16	3,579
	Limber pine	257	--	--	--	257
	White fir	611	--	--	--	611
	Pinyon-juniper	34	--	--	--	34
	Aspen	--	--	--	--	--
	All types	5,091	509	161	16	5,777
Private:						
	Douglas-fir	35,227	5,147	3,086	--	43,460
	Ponderosa pine	111,791	12,012	3,332	417	127,552
	Limber pine	6,822	--	--	--	6,822
	White fir	26,106	--	--	--	26,106
	Pinyon-juniper	1,610	--	--	--	1,610
	Aspen	6,511	--	--	--	6,511
	All types	188,067	17,159	6,418	417	212,061
State and private:						
	Douglas-fir	36,287	5,313	3,156	--	44,756
	Ponderosa pine	114,920	12,355	3,423	433	131,131
	Limber pine	7,079	--	--	--	7,079
	White fir	26,717	--	--	--	26,717
	Pinyon-juniper	1,644	--	--	--	1,644
	Aspen	6,511	--	--	--	6,511
	All types	193,158	17,668	6,579	433	217,838

[1]International 1/4-inch rule.

Table 15.--*Net volume of growing stock on commercial timberland in San Miguel County by species and diameter class; State and private, 1975*

Species	Diameter class (inches at breast height)													
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand cubic feet													
Douglas-fir	974	1,279	2,125	1,722	1,502	1,291	581	591	193	190	172	--	116	10,736
Ponderosa pine	3,365	6,858	7,683	6,818	6,080	2,998	2,266	456	670	508	295	--	139	38,136
Limber pine	199	60	121	201	39	471	260	218	134	71	64	--	--	1,838
Subalpine fir	89	119	--	89	--	--	--	71	--	--	--	--	--	368
White fir	452	1,093	980	1,063	682	961	914	750	430	122	94	110	184	7,835
Engelmann spruce	42	72	140	--	249	77	203	31	53	146	--	--	--	1,013
Pinyon/juniper	5	88	28	--	--	--	--	--	--	--	--	--	--	121
Total softwoods	5,126	9,569	11,077	9,893	8,552	5,798	4,224	2,117	1,480	1,037	625	110	439	60,047
Aspen	1,631	843	658	380	383	229	84	40	--	--	--	--	--	4,248
Other hardwoods	23	78	--	--	--	--	--	--	--	--	--	--	--	101
Total hardwoods	1,654	921	658	380	383	229	84	40	--	--	--	--	--	4,349
All species	6,780	10,490	11,735	10,273	8,935	6,027	4,308	2,157	1,480	1,037	625	110	439	64,396

Table 16.--*Net volume of sawtimber on commercial timberland in San Miguel County by species and diameter class; State and private, 1975*

Species	Diameter class (inches at breast height)												
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand board feet, International 1/4-inch rule											
Douglas-fir	6,930	7,356	7,172	6,644	3,151	3,279	1,093	1,089	994	--	678	38,386
Ponderosa pine	26,495	31,570	32,216	16,978	13,465	2,759	4,075	3,111	1,813	--	847	133,329
Limber pine	399	806	179	2,343	1,316	1,134	719	389	360	--	--	7,645
Subalpine fir	--	438	--	--	--	362	--	--	--	--	--	800
White fir	3,870	4,688	3,123	4,343	4,037	3,171	1,726	478	369	430	729	26,964
Engelmann spruce	610	--	1,279	400	1,052	159	274	759	--	--	--	4,533
Pinyon/juniper	84	--	--	--	--	--	--	--	--	--	--	84
Total softwoods	38,388	44,858	43,969	30,708	23,021	10,864	7,887	5,826	3,536	430	2,254	211,741
Aspen	0	1,997	2,130	1,287	464	219	--	--	--	--	--	6,097
Other hardwoods	0	--	--	--	--	--	--	--	--	--	--	--
Total hardwoods	0	1,997	2,130	1,287	464	219	--	--	--	--	--	6,097
All species	38,388	46,855	46,099	31,995	23,485	11,083	7,887	5,826	3,536	430	2,254	217,838

Table 17.--*Net volume of growing stock and sawtimber on commercial timberland in San Miguel County by ownership class and species, 1975*

Ownership class	Species											
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/ juniper	Total softwoods	Aspen	Other hardwoods	Total hardwoods	All species
	GROWING STOCK *Thousand cubic feet*											
State	267	1,033	62	13	212	21	7	1,615	80	3	83	1,698
Private	10,469	37,103	1,776	355	7,623	992	114	58,432	4,168	98	4,266	62,698
Total	10,736	38,136	1,838	368	7,835	1,013	121	60,047	4,248	101	4,349	64,396
	GROWING STOCK *Thousand cubic meters*											
State	8	29	2	(1)	6	1	(1)	46	2	(1)	2	48
Private	296	1,051	50	10	216	28	3	1,654	118	3	121	1,775
Total	304	1,080	52	10	222	29	3	1,700	120	3	123	1,823
	SAWTIMBER *Thousand board feet, International 1/4-inch rule*											
State	937	3,654	257	29	732	91	3	5,703	74	--	74	5,777
Private	37,449	129,675	7,388	771	26,232	4,442	81	206,038	6,023	--	6,023	212,061
Total	38,386	133,329	7,645	800	26,964	4,533	84	211,741	6,097	--	6,097	217,838

Table 18.--*Net volume of timber on commercial timberland in San Miguel County by class of timber, and softwoods and hardwoods; State and private, 1975*

Class of timber	Softwoods	Hardwoods	All classes
	Thousand cubic feet		
Sawtimber trees:			
Saw-log portion	41,718	1,064	42,782
Upper-stem portion	3,634	52	3,686
Total	45,352	1,116	46,468
Poletimber trees	14,695	3,233	17,928
All growing stock trees	60,047	4,349	64,396
Sound cull trees	885	432	1,317
Rotten cull trees	166	161	327
Salvable dead trees	231	26	257
All timber	61,329	4,968	66,297

Table 19.--*Net volume of growing stock on commercial timberland in San Miguel County by forest type and species; State and private, 1975*

Forest type	Species											All species	
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/juniper	Total softwoods	Aspen	Other hardwoods	Total hardwoods		
	Thousand cubic feet												*Thousand cubic meters*
Douglas-fir	6,579	2,375	60	--	2,611	370	--	11,995	1,246	23	1,269	13,264	376
Ponderosa pine	2,456	34,767	442	--	783	--	48	38,496	--	78	78	38,574	1,092
Limber pine	--	--	1,264	368	61	--	--	1,693	81	--	81	1,774	50
White fir	1,411	485	72	--	4,361	282	--	6,611	1,443	--	1,443	8,054	228
Pinyon-juniper	--	509	--	--	--	--	73	582	--	--	--	582	16
Aspen	290	--	--	--	19	361	--	670	1,478	--	1,478	2,148	61
All types	10,736	38,136	1,838	368	7,835	1,013	121	60,047	4,248	101	4,349	64,396	--
	Thousand cubic meters												
All types	304	1,080	52	10	222	29	3	1,700	120	3	123	--	1,823

Table 20.--*Net volume of sawtimber on commercial timberland in San Miguel County by forest type and species; State and private, 1975*

Forest type	Species											All species
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/ juniper	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	Thousand board feet, International 1/4-inch rule											
Douglas-fir	23,644	9,433	--	--	8,375	1,844	--	43,296	1,460	--	1,460	44,756
Ponderosa pine	7,584	120,063	1,325	--	2,075	--	84	131,131	--	--	--	131,131
Limber pine	--	--	6,025	800	254	--	--	7,079	--	--	--	7,079
White fir	6,105	2,189	295	--	16,178	959	--	25,726	991	--	991	26,717
Pinyon-juniper	--	1,644	--	--	--	--	--	1,644	--	--	--	1,644
Aspen	1,053	--	--	--	82	1,730	--	2,865	3,646	--	3,646	6,511
All types	38,386	133,329	7,645	800	26,964	4,533	84	211,741	6,097	--	6,097	217,838

Table 21.--*Net annual growth of growing stock and sawtimber on commercial timberland in San Miguel County by ownership class and species, 1975*

Ownership class	Species											All species
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Total softwoods	Aspen	Other hardwoods	Total hardwoods		
	GROWING STOCK *Cubic feet*											
State	7,681	27,829	1,060	557	4,837	486	42,450	6,144	-254	5,890		48,340
Private	310,102	1,067,069	29,805	14,809	179,863	23,055	1,624,703	276,923	-6,748	270,175		1,894,878
Total	317,783	1,094,898	30,865	15,366	184,700	23,541	1,667,153	283,067	-7,002	276,065		1,943,218
	GROWING STOCK *Cubic meters*											
State	217	788	30	16	137	14	1,202	174	-7	167		1,369
Private	8,782	30,216	844	419	5,093	653	46,007	7,841	-191	7,650		53,657
Total	8,999	31,004	874	435	5,230	667	47,209	8,015	-198	7,817		55,026
	SAWTIMBER *Board feet, International 1/4-inch rule*											
State	28,123	125,822	3,576	729	11,505	2,042	171,797	-772	-1,424	-2,196		169,601
Private	1,202,695	4,826,443	104,485	19,385	463,713	98,111	6,714,832	193,856	-37,840	156,016		6,870,848
Total	1,230,818	4,952,265	108,061	20,114	475,218	100,153	6,886,629	193,084	-39,264	153,820		7,040,449

Table 22.--*Annual mortality of growing stock and sawtimber on commercial timberland in San Miguel County by ownership class, and softwoods and hardwoods, 1975*

Species group and ownership class	Growing stock		Sawtimber
	- Cubic feet -	*- Cubic meters -*	*- Board feet*[1] *-*
Softwoods:			
State	8,886	251	39,067
Private	238,711	6,760	1,037,941
Total	247,597	7,011	1,077,008
Hardwoods:			
State	654	19	3,632
Private	24,928	706	138,173
Total	25,582	725	141,805

[1]International 1/4-inch rule.

Table 23.--*Annual mortality of growing stock and sawtimber on commercial timberland in San Miguel County by cause of death and species; State and private, 1975*

Cause of death	Species							All species
	Douglas-fir	Ponderosa pine	White fir	Total softwoods	Aspen	Other hardwoods	Total hardwoods	
	GROWING STOCK							
	Cubic feet							
Insects	--	--	--	--	--	--	--	--
Disease	--	--	--	--	18,580	--	18,580	18,580
Fire	24,422	181,915	--	206,337	--	--	--	206,337
Animal	--	--	--	--	--	--	--	--
Weather	--	--	21,363	21,363	--	--	--	21,363
Suppression	--	4,680	--	4,680	--	--	--	4,680
Unknown	--	--	15,217	15,217	--	7,002	7,002	22,219
Logging	--	--	--	--	--	--	--	--
Total	24,422	186,595	36,580	247,597	18,580	7,002	25,582	273,179
	GROWING STOCK							
	Cubic meters							
Insects	--	--	--	--	--	--	--	--
Disease	--	--	--	--	526	--	526	526
Fire	692	5,151	--	5,843	--	--	--	5,843
Animal	--	--	--	--	--	--	--	--
Weather	--	--	605	605	--	--	--	605
Suppression	--	133	--	133	--	--	--	133
Unknown	--	--	430	430	--	199	199	629
Logging	--	--	--	--	--	--	--	--
Total	692	5,284	1,035	7,011	526	199	725	7,736
	SAWTIMBER							
	Board feet, International 1/4-inch rule							
Insects	--	--	--	--	--	--	--	--
Disease	--	--	--	--	102,541	--	102,541	102,541
Fire	104,910	814,792	--	919,702	--	--	--	919,702
Animal	--	--	--	--	--	--	--	--
Weather	--	--	89,381	89,381	--	--	--	89,381
Suppression	--	--	--	--	--	--	--	--
Unknown	--	--	67,925	67,925	--	39,264	39,264	107,189
Logging	--	--	--	--	--	--	--	--
Total	104,910	814,792	157,306	1,077,008	102,541	39,264	141,805	1,218,813

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Barrett, Michael K., and Dorothy G. Shupe.
1980. Forest area and timber resource statistics for San Miguel County, New Mexico, 1975. USDA For. Serv. Resour. Bull. INT-17, 23 p. Intermt. For. and Range Exp. Stn. Ogden, Utah 84401.

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KEYWORDS: forest surveys (regional), forest area classification, stand volume.

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The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

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FOREST AREA AND TIMBER RESOURCE STATISTICS FOR COLFAX COUNTY, NEW MEXICO, 1976

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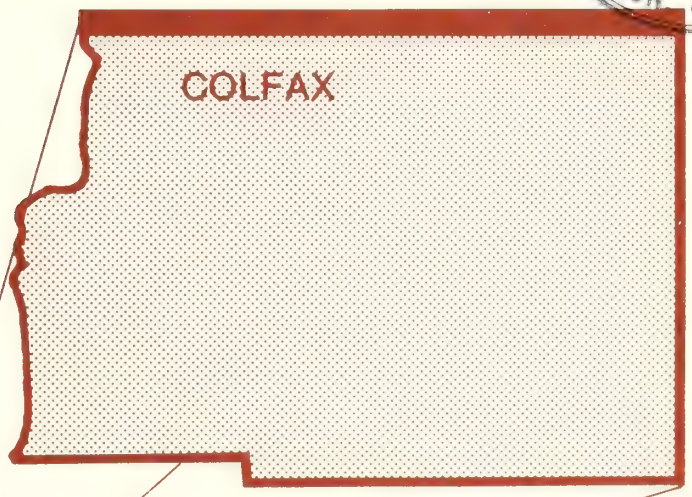

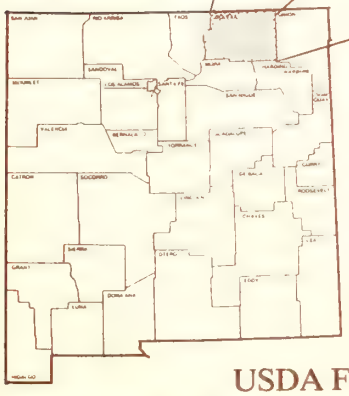

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FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE

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FOREST AREA AND TIMBER RESOURCE STATISTICS FOR COLFAX COUNTY, NEW MEXICO, 1976

Michael K. Barrett

and

Dorothy G. Shupe

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
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Ogden, Utah 84401

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RESEARCH SUMMARY

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

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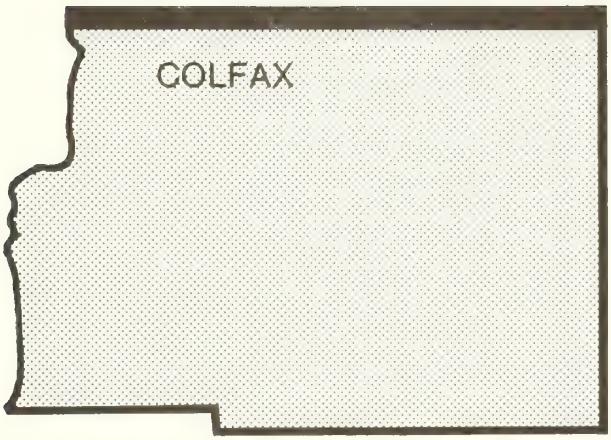
Colfax County



INTRODUCTION

A comprehensive timber resource study was conducted on State and private lands in Colfax County, New Mexico (fig. 1) from 1975 to 1976 by the New Mexico Department of State Forestry in cooperation with the Division of State and Private Forestry, Forest Service, Region 3, and the Intermountain Forest and Range Experiment Station.

The total land area in Colfax County is 2,408,960 acres (974,876 hectares). The Forest Service and the Bureau of Land Management together manage 12,039 acres (4,872 hectares), only about one-half of one percent of this land. The remaining 2,396,921 acres (970,004 hectares) are in State, private, and other ownerships. The data presented here are for State, private, and County and municipal lands only.

Highlights show the area of commercial timberland in comparison to total forest land area, and the distribution of this area by forest type, stand-size class, and site class. Discussions of the data reliability and terminology are included. These two items should be reviewed carefully when using this information.

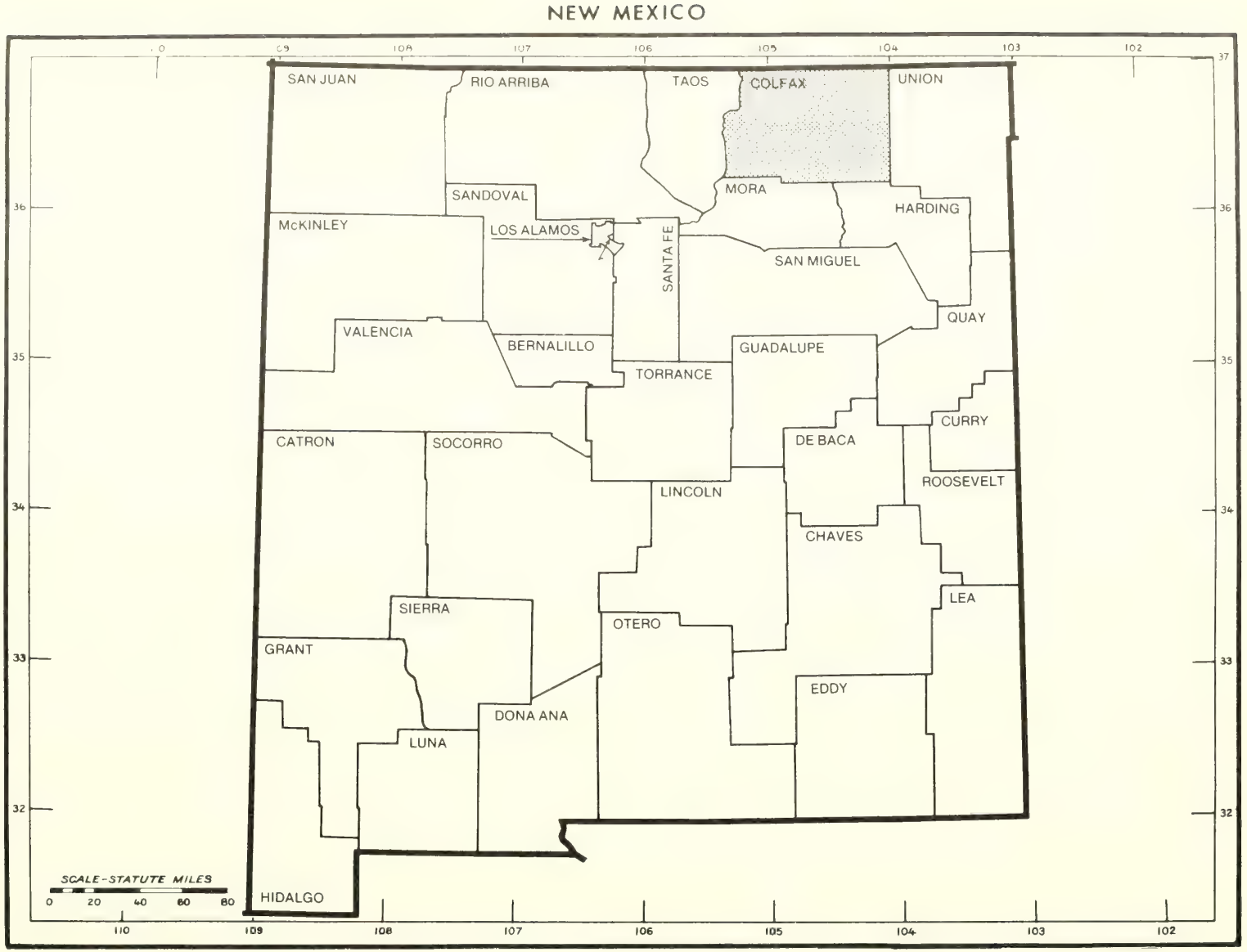


Figure 1.--Location of Colfax County in New Mexico.

HIGHLIGHTS

Area

- The forest land area is 883,803 acres (357,664 hectares), or 37 percent of the total State and private land area in the County.

- Of the forest land, 532,433 acres (215,469 hectares), or 60 percent are classified as commercial timberland.

- Private ownership accounts for 474,063 acres (191,847 hectares), or 89 percent of the commercial timberland.

- The predominant forest types are ponderosa pine, Douglas-fir, and Engelmann spruce which together occupy 81 percent of the commercial timberland. The remaining area consists of pinyon-juniper,[1] aspen, spruce-subalpine fir, and white fir forest types.

- Sixty percent of the commercial timberland is sawtimber stands; poletimber stands occupy 21 percent; the remaining 19 percent is in sapling and seedling stands and nonstocked.

- Nearly 90 percent of the commercial timberland is in the 20 to 49 cubic-foot productivity class.

Inventory

- Growing stock volume amounts to 311,917 thousand cubic feet (8,833 thousand cubic meters) with the major portion, about 70 percent, in softwood sawtimber trees.

- Rough, rotten, and salvable dead trees comprised 30,279 thousand cubic feet (857 thousand cubic meters), or 8.8 percent, of the total sound wood volume.

- About 90 percent of the 1,068,065 thousand board feet[2] of sawtimber volume is in sawtimber trees less than 21 inches d.b.h.

- Ponderosa pine and Engelmann spruce together make up 65 percent of the growing stock volume and 74 percent of the sawtimber volume. Species sharing the remaining percentage are Douglas-fir, white fir, subalpine fir, aspen, pinyon pine, juniper, and limber pine. Pinyon and juniper account for less than 2 percent of the total growing stock volume.

- About 87 percent of the softwood growing stock volume and 88 percent of the softwood sawtimber volume is privately owned.

---

[1]The area occupied by pinyon-juniper forest type classified as commercial is so classified because the site index for other associated species on these stands (usually ponderosa pine or Douglas-fir) was high enough to indicate a site potential productivity level exceeding 20 cubic feet per acre per year average annual growth, and nonstockable indicators were not present in sufficient quantities to lower the yield capability below 20 cubic feet per acre per year. Although pinyon/juniper usually occurs on unproductive forest land, when it occurs in mixtures with other species on productive sites, it is reported in the commercial timberland statistics.

[2]International 1/4-inch rule.

Growth and Mortality

- Net annual growth of growing stock totaled 8,144,792 cubic feet (230,635 cubic meters) with 89 percent occurring in softwood species; mainly ponderosa pine, Engelmann spruce, and Douglas-fir. Growth and mortality were not measured for pinyon and juniper trees.

- About 87 percent of the total net growth is on private land.

- The annual mortality of 556,007 cubic feet (15,744 cubic meters) offsets 6.4 percent of the gross annual growth.

- Fire and logging activity accounted for 37 percent of the mortality.

- Over 70 percent of the mortality occurs in ponderosa pine.

DATA RELIABILITY

Individual cells within tables should be used with caution. Some are based on very small sample sizes, and so result in high sampling errors. The standard error percents shown in tables 1 and 2 were calculated at the 67 percent confidence level.

Table 1.--*Area of forest land and percent standard error for Colfax County, 1976*

Item	Softwood types		Hardwood types		All types	
	Acres	Percent standard error	Acres	Percent standard error	Acres	Percent standard error
Commercial timberland	496,538	5.8	35,895	41.4	532,433	4.9
Other forest land	193,480	11.7	157,890	12.7	351,370	8.3

Table 2.--*Net volume and net annual growth and annual mortality of growing stock and sawtimber on commercial timberland, with percent standard error for Colfax County, 1976*

Item	Softwoods		Hardwoods		All species	
	Volume	Percent standard error	Volume	Percent standard error	Volume	Percent standard error
Net volume:						
Growing stock (M cubic feet)	284,166	9.6	27,751	45.1	311,917	9.6
Sawtimber (M board feet[1])	1,040,069	11.7	27,996	56.0	1,068,065	11.5
Net annual growth:						
Growing stock (cubic feet)	7,257,000	10.3	887,792	34.8	8,144,792	10.4
Sawtimber (board feet[1])	31,198,284	14.0	650,232	53.2	31,848,516	13.7
Annual mortality:						
Growing stock (cubic feet)	556,007	42.8	--	0	556,007	42.8
Sawtimber (board feet[1])	1,994,652	48.6	--	0	1,994,652	48.6

[1]International 1/4-inch rule.

TERMINOLOGY AND DATA TABLES

The following terminology section contains definitions that are relevant to the timber resource data presented in this resource bulletin. Forest area and timber resource data for Colfax County, New Mexico, are displayed in tables 3 through 23.

TERMINOLOGY

Land

Bureau of the Census.--The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds less than 40 acres in area.

Water

Census water.--As defined by the Bureau of the Census: streams, sloughs, estuaries, and canals more than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds more than 40 acres in area.

Noncensus water.--The same as defined by the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Land Use Classes

Forest land.--Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Commercial timberland.--Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Productive-reserved forest land.--Forest land sufficiently productive to qualify as commercial timberland, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Other forest land.--(1) Forest land incapable of producing 20 cubic feet per acre of industrial wood under management, because of adverse site conditions; (2) unproductive-reserved forest land.

Nonforest land.--Land that has never supported forests and lands formerly forested where use for timber management is precluded by development for other uses.

Public Ownership Classes

National Forest land.--Federal lands legally designated as National Forest or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands.--Federal lands administered by the Bureau of Land Management.

Indian lands.--Tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

State lands.--Lands owned by States, or lands leased to these governmental units for 50 years or more.

Private Ownership Classes

County and municipal lands.--Lands owned by counties and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Forest industry lands.--Lands owned by companies or individuals operating wood-using plants.

Farmer-owned lands.--Lands owned by farm operators. (Note: These exclude lands leased by farm operators from nonfarm owners, such as railroad companies and States.)

Miscellaneous Federal lands.--Federal lands other than the following: (1) National Forest lands; (2) lands administered by the Bureau of Land Management; and (3) Indian lands.

Miscellaneous private lands.--Privately owned lands other than forest industry and farmer-owned lands.

Forest Type and Tree Species

Forest types.--A classification of forest land based upon the species forming a plurality of live-tree stocking.

Forest trees.--Woody plants having a well-developed stem and usually more than 12 feet in height at maturity.

Commercial species.--Tree species presently or prospectively suitable for industrial wood products.

Softwoods.--Coniferous trees, usually evergreen, having needles or scalelike leaves.

Hardwoods.--Dicotyledonous trees, usually broad-leaved and deciduous.

Area Condition Classes

Stocking.--Stocking is an effort to express the extent to which growing space is effectively utilized by present or potential growing stock trees of commercial species. "Percent of stocking" is synonymous with "percentage of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

"Stocking percentages" express current area occupancy in relation to specified standards for full stocking based on number, size, and spacing of trees considered necessary to fully utilize the forest land.

Full utilization of the site is assumed to occur over a range of basal area. As an interim guide 60 percent of the normal yield table values has been used to establish the lower limit of the range, which represents full-site occupancy. This is called 100-percent stocking. The upper limit of full stocking has been set at 132 percent. Sites with less than 100-percent stocking represent understocking with less than full-site occupancy. Overstocking is characterized by sites with over 133-percent stocking.

Class 10.--Area fully stocked (100-132 percent) with desirable trees and not overstocked (133 percent or more).

Class 20.--Area fully stocked with desirable trees, but overstocked with all live trees.

Class 30.--Areas medium to fully stocked (60-99 percent) with desirable trees and with less than 30 percent of the area controlled by other trees and (or) inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

Class 40.--Areas medium to fully stocked with desirable trees and with 30 percent or more of the area controlled by other trees and (or) conditions that ordinarily prevent occupancy by desirable trees.

Class 50.--Areas poorly stocked (16.7-59 percent) with desirable trees, but fully stocked with growing stock trees.

Class 60.--Areas poorly stocked with desirable trees, but with medium to full stocking of growing stock trees.

Class 70.--Areas nonstocked (less than 16.7 percent) or poorly stocked with desirable trees, and poorly stocked with growing stock trees.

Class 80.--Low-risk old-growth stands.

Class 90.--High-risk old-growth stands.

Nonstocked.--Areas less than 16.7 percent stocked with growing stock trees.

Class of Timber

Growing stock trees.--Live trees of commercial species qualifying as desirable or acceptable trees. (Note: Excludes rough, rotten, and dead trees.)

Desirable trees.--Growing stock trees (a) having no serious defect in quality limiting present or prospective use for timber products; (b) of relatively high vigor; and (c) containing no pathogens that may result in death or serious deterioration before rotation age.

Acceptable trees.--Growing stock trees that meet specified standards of size and quality, but not qualifying as desirable trees.

Rough trees.--(1) Live trees of commercial species that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of roughness or poor form; (2) all live trees of noncommercial species.

Rotten trees.--Live trees that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and (or) do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume (cubic-foot basis) in a tree is rotten.

Cull.--Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Salvable dead trees.--Standing or down dead trees that are considered merchantable by Rocky Mountain Regional standards.

Mortality trees.--Trees, formerly growing stock, dying from natural causes during a specified period, usually 1 year.

Saw-log portion.--That part of the bole of sawtimber trees between the stump and the saw-log top. A 1-foot stump is used.

Upper-stem portion.--That part of the bole of sawtimber trees above the saw log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs, whichever occurs first.

Tree Size Classes

Seedlings.--Live trees less than 1.0 inch in diameter at breast height.

Saplings.--Trees 1.0-4.9 inches in diameter at breast height.

Poletimber trees.--Trees at least 5.0 inches in d.b.h., but smaller than sawtimber size.

Sawtimber trees.--Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches, and 11.0 inches for hardwoods.

Volume

Net volume.--Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Growing stock volume.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

Sawtimber volume.--Net volume in board feet of sawtimber trees of commercial species. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

Growth and Mortality

Net annual growth.--The increase in net growing stock volume of a specified size class for a specific year. (Note: Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus net volume of trees reaching the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten trees during the year.)

Mortality.--Number or sound-wood volume of growing stock trees dying from natural causes during a specified period.

Site

Site class.--A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean net annual growth of growing stock (not including thinnings or mortality loss) attainable at culmination of mean net annual growth over age. Height-age relationships are usually used as indicators of the specified volume-site class.

Stand-Size Classes

Sawtimber stands.--Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.--Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and (or) sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.--Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and (or) seedlings.

Nonstocked land.--Commercial timberland less than 16.7 percent stocked with growing stock trees.

FOREST SURVEY TABLES

Table 3.--*Total area in Colfax County by ownership class, 1976*

Ownership class	Acres	Hectares
National Forest[1]	11,778	4,766
Bureau of Land Management	261	106
Indian	--	--
State	282,600	114,365
Private and other	2,114,321	855,639
Total land area	2,408,960	974,876
Census water	4,544	1,839
Gross area[2]	2,413,504	976,715

[1]Includes National Grasslands administered by National Forest Systems.
[2]U.S. Bureau of the Census, land and water area of the United States, 1970.

Table 4.--*Land area in Colfax County by major land class and ownership class, 1976*

Land class	Ownership class			
	State		Private[1]	
	Acres	Hectares	Acres	Hectares
Commercial timberland	58,370	23,622	474,063	191,847
Productive reserved	--	--	--	--
Other forest land:				
Unproductive reserved	--	--	--	--
Unproductive nonreserved	35,444	14,344	315,926	127,851
Total forest land	93,814	37,966	789,989	319,698
Nonforest land	188,786	76,399	1,324,332	535,941
Total land area	282,600	114,365	2,114,321	855,639

[1]On this and all later tables, the private ownership category includes a negligible portion of county and municipal ownership.

Table 5.--*Area of commercial timberland in Colfax County by forest type, stand-size class, and site class, State owned, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	--	--	2,544	2,544
Poletimber	--	--	--	1,330	3,991	5,321
Sapling and seedling	--	--	--	--	2,826	2,826
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,330	9,361	10,691
Ponderosa pine:						
Sawtimber	--	--	--	--	18,254	18,254
Poletimber	--	--	--	--	4,658	4,658
Sapling and seedling	--	--	--	--	654	654
Nonstocked	--	--	--	--	2,268	2,268
Total	--	--	--	--	25,834	25,834
Spruce-subaipine fir:						
Sawtimber	--	--	--	1,330	--	1,330
Poletimber	--	--	--	--	1,331	1,331
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	1,330	1,331	2,661
White fir:						
Sawtimber	--	--	--	654	1,330	1,984
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	654	654
Nonstocked	--	--	--	--	--	--
Total	--	--	--	654	1,984	2,638
Engelmann spruce:						
Sawtimber	--	--	1,295	1,295	2,259	4,849
Poletimber	--	--	--	--	2,661	2,661
Sapling and seedling	--	--	--	1,295	--	1,295
Nonstocked	--	--	--	--	--	--
Total	--	--	1,295	2,590	4,920	8,805
Pinyon-juniper:						
Sawtimber	--	--	--	--	568	568
Poletimber	--	--	--	--	198	198
Sapling and seedling	--	--	--	--	761	761
Nonstocked	--	--	--	--	199	199
Total	--	--	--	--	1,726	1,726
Total softwoods:						
Sawtimber	--	--	1,295	3,279	24,955	29,529
Poletimber	--	--	--	1,330	12,839	14,169
Sapling and seedling	--	--	--	1,295	4,895	6,190
Nonstocked	--	--	--	--	2,467	2,467
Total	--	--	1,295	5,904	45,156	52,355
Aspen:						
Sawtimber	--	--	--	1,330	--	1,330
Poletimber	--	--	--	1,071	--	1,071
Sapling and seedling	--	--	--	654	2,960	3,614
Nonstocked	--	--	--	--	--	--
Total	--	--	--	3,055	2,960	6,015
All types:						
Sawtimber	--	--	1,295	4,609	24,955	30,859
Poletimber	--	--	--	2,401	12,839	15,240
Sapling and seedling	--	--	--	1,949	7,855	9,804
Nonstocked	--	--	--	--	2,467	2,467
Total	--	--	1,295	8,959	48,116	58,370

Table 6.--*Area of commercial timberland in Colfax County by forest type, stand-size class, and site class, private owned, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
				Acres		
Douglas-fir:						
Sawtimber	--	--	--	--	32,104	32,104
Poletimber	--	--	--	6,411	19,231	25,642
Sapling and seedling	--	--	--	--	15,050	15,050
Nonstocked	--	--	--	--	--	--
Total	--	--	--	6,411	66,385	72,796
Ponderosa pine:						
Sawtimber	--	--	--	--	201,458	201,458
Poletimber	--	--	--	--	42,377	42,377
Sapling and seedling	--	--	--	--	2,856	2,856
Nonstocked	--	--	--	--	28,953	28,953
Total	--	--	--	--	275,644	275,644
Spruce-subalpine fir:						
Sawtimber	--	--	--	6,410	--	6,410
Poletimber	--	--	--	--	6,410	6,410
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	6,410	6,410	12,820
White fir:						
Sawtimber	--	--	--	2,856	6,410	9,266
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	2,856	2,856
Nonstocked	--	--	--	--	--	--
Total	--	--	--	2,856	9,266	12,122
Engelmann spruce:						
Sawtimber	--	--	5,261	5,261	7,772	18,294
Poletimber	--	--	--	--	12,821	12,821
Sapling and seedling	--	--	--	5,261	--	5,261
Nonstocked	--	--	--	--	--	--
Total	--	--	5,261	10,522	20,593	36,376
Pinyon-juniper:						
Sawtimber	--	--	--	--	15,269	15,269
Poletimber	--	--	--	--	7,996	7,996
Sapling and seedling	--	--	--	--	3,164	3,164
Nonstocked	--	--	--	--	7,996	7,996
Total	--	--	--	--	34,425	34,425
Total softwoods:						
Sawtimber	--	--	5,261	14,527	263,013	282,801
Poletimber	--	--	--	6,411	88,835	95,246
Sapling and seedling	--	--	--	5,261	23,926	29,187
Nonstocked	--	--	--	--	36,949	36,949
Total	--	--	5,261	26,199	412,723	444,183
Aspen:						
Sawtimber	--	--	--	6,410	--	6,410
Poletimber	--	--	--	2,819	--	2,819
Sapling and seedling	--	--	--	2,856	17,795	20,651
Nonstocked	--	--	--	--	--	--
Total	--	--	--	12,085	17,795	29,880
All types:						
Sawtimber	--	--	5,261	20,937	263,013	289,211
Poletimber	--	--	--	9,230	88,835	98,065
Sapling and seedling	--	--	--	8,117	41,721	49,838
Nonstocked	--	--	--	--	36,949	36,949
Total	--	--	5,261	38,284	430,518	474,063

Table 7.--*Area of commercial timberland in Colfax County by forest type, stand-size class, and site class, summary--State and private, 1976*

Forest type and stand-size class	Site class					Total acres
	165+	120-164	85-119	50-84	20-49	
	Acres					
Douglas-fir:						
Sawtimber	--	--	--	--	34,648	34,648
Poletimber	--	--	--	7,741	23,222	30,963
Sapling and seedling	--	--	--	--	17,876	17,876
Nonstocked	--	--	--	--	--	--
Total	--	--	--	7,741	75,746	83,487
Ponderosa pine:						
Sawtimber	--	--	--	--	219,712	219,712
Poletimber	--	--	--	--	47,035	47,035
Sapling and seedling	--	--	--	--	3,510	3,510
Nonstocked	--	--	--	--	31,221	31,221
Total	--	--	--	--	301,478	301,478
Spruce-subalpine fir:						
Sawtimber	--	--	--	7,740	--	7,740
Poletimber	--	--	--	--	7,741	7,741
Sapling and seedling	--	--	--	--	--	--
Nonstocked	--	--	--	--	--	--
Total	--	--	--	7,740	7,741	15,481
White fir:						
Sawtimber	--	--	--	3,510	7,740	11,250
Poletimber	--	--	--	--	--	--
Sapling and seedling	--	--	--	--	3,510	3,510
Nonstocked	--	--	--	--	--	--
Total	--	--	--	3,510	11,250	14,760
Engelmann spruce:						
Sawtimber	--	--	6,556	6,556	10,031	23,143
Poletimber	--	--	--	--	15,482	15,482
Sapling and seedling	--	--	--	6,556	--	6,556
Nonstocked	--	--	--	--	--	--
Total	--	--	6,556	13,112	25,513	45,181
Pinyon-juniper:						
Sawtimber	--	--	--	--	15,837	15,837
Poletimber	--	--	--	--	8,194	8,194
Sapling and seedling	--	--	--	--	3,925	3,925
Nonstocked	--	--	--	--	8,195	8,195
Total	--	--	--	--	36,151	36,151
Total softwoods:						
Sawtimber	--	--	6,556	17,806	287,968	312,330
Poletimber	--	--	--	7,741	101,674	109,415
Sapling and seedling	--	--	--	6,556	28,821	35,377
Nonstocked	--	--	--	--	39,416	39,416
Total	--	--	6,556	32,103	457,879	496,538
Aspen:						
Sawtimber	--	--	--	7,740	--	7,740
Poletimber	--	--	--	3,890	--	3,890
Sapling and seedling	--	--	--	3,510	20,755	24,265
Nonstocked	--	--	--	--	--	--
Total	--	--	--	15,140	20,755	35,895
All types:						
Sawtimber	--	--	6,556	25,546	287,968	320,070
Poletimber	--	--	--	11,631	101,674	113,305
Sapling and seedling	--	--	--	10,066	49,576	59,642
Nonstocked	--	--	--	--	39,416	39,416
Total	--	--	6,556	47,243	478,634	532,433

Table 8.--*Area of commercial timberland in Colfax County by stand volume and ownership classes, 1976*

Stand volume per acre[1]	Ownership class		
	State	Private	State and private
	Acres		
Less than 1,500 board feet	54,781	459,880	514,661
1,500 to 4,999 board feet	3,589	14,183	17,772
5,000 to 9,999 board feet	--	--	--
10,000 board feet or more	--	--	--
All classes	58,370	474,063	532,433

[1]International 1/4-inch rule.

Table 9.--*Area of commercial timberland in Colfax County by forest type and area condition class; State and private, 1976*

Forest type	Area condition class									Nonstocked	All classes	
	10	20	30	40	50	60	70	80	90			
	Acres											*Hectares*
Douglas-fir	--	--	29,778	--	--	10,135	40,064	3,510	--	--	83,487	33,786
Ponderosa pine	--	--	--	--	8,194	68,572	134,795	24,432	34,264	31,221	301,478	122,005
Spruce-subalpine fir	--	--	15,481	--	--	--	--	--	--	--	15,481	6,266
White fir	--	--	3,510	--	7,741	--	3,509	--	--	--	14,760	5,973
Engelmann spruce	--	--	17,773	--	--	20,852	--	--	6,556	--	45,181	18,284
Pinyon-juniper	--	--	--	--	--	7,643	12,118	--	8,195	8,195	36,151	14,629
Total softwoods	--	--	66,542	--	15,935	107,202	190,486	27,942	49,015	39,416	496,538	200,943
Aspen	--	7,643	10,065	--	3,890	6,556	7,741	--	--	--	35,895	14,526
All types	--	7,643	76,607	--	19,825	113,758	198,227	27,942	49,015	39,416	532,433	215,469

Table 10.--*Area of unproductive nonreserved forest land in Colfax County by forest type and ownership class, 1976*

Forest type	Ownership class					
	State		Private		State and private	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
Pinyon-juniper	4,796	1,941	70,962	28,717	75,758	30,658
Mixed softwoods	7,297	2,953	110,425	44,688	117,722	47,641
Aspen	3,259	1,319	11,433	4,627	14,692	5,946
Mixed hardwoods	20,092	8,131	123,106	49,819	143,198	57,950
All types	35,444	14,344	315,926	127,851	351,370	142,195

Table 11.--*Number of growing stock trees on commercial timberland in Colfax County by species and diameter class; State and private, 1976*

Species	Diameter class (inches at breast height)															
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand trees															
Douglas-fir	6,788	2,641	2,706	2,241	1,213	483	446	134	134	23	34	19	9	--	--	16,871
Ponderosa pine	5,835	10,015	8,274	6,685	3,482	2,769	1,677	784	387	167	95	86	--	7	5	40,268
Limber pine	315	798	61	141	111	21	--	--	--	--	--	--	--	--	--	1,447
Subalpine fir	1,393	1,858	1,912	206	283	137	81	10	25	14	5	--	--	--	--	5,924
White fir	12,752	2,418	1,403	782	387	369	123	65	97	6	15	5	--	--	--	18,422
Engelmann spruce	7,574	9,700	2,895	1,769	1,955	705	259	162	30	14	20	--	--	--	--	25,083
Pinyon/juniper	1,209	3,856	1,430	843	169	102	57	46	--	--	--	--	--	--	--	7,712
Total softwoods	35,866	31,286	18,681	12,667	7,600	4,586	2,643	1,201	673	224	169	110	9	7	5	115,727
Aspen	6,939	5,567	1,886	1,578	905	150	95	23	8	--	--	--	--	--	--	17,151
All species	42,805	36,853	20,567	14,245	8,505	4,736	2,738	1,224	681	224	169	110	9	7	5	132,878

Table 12.--*Number of cull and salvable dead trees on commercial timberland in Colfax County by ownership class, and softwoods and hardwoods, 1976*

Ownership class and species group	Cull trees			Salvable dead trees
	Sound	Rotten	Total	
	Thousand trees			
State:				
Softwoods	5,147	50	5,197	274
Hardwoods	632	89	721	113
Total	5,779	139	5,918	387
Private:				
Softwoods	30,736	263	30,999	1,345
Hardwoods	3,168	435	3,603	408
Total	33,904	698	34,602	1,753
State and private:				
Softwoods	35,883	313	36,196	1,619
Hardwoods	3,800	524	4,324	521
Total	39,683	837	40,520	2,140

Table 15.--*Net volume of growing stock on commercial timberland in Colfax County by ownership class, forest type, and stand-size class, 1976*

Ownership class	Forest type	Stand-size class				All classes	
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked		
		Thousand cubic feet					*Thousand cubic meters*
State:							
	Douglas-fir	1,900	2,524	733	--	5,157	146
	Ponderosa pine	11,527	1,737	20	428	13,712	388
	Spruce-subalpine fir	2,966	1,268	--	--	4,234	120
	White fir	2,073	--	174	--	2,247	64
	Engelmann spruce	5,862	3,037	859	--	9,758	277
	Pinyon-juniper	102	47	33	9	191	5
	Aspen	1,086	3,370	706	--	5,162	146
	All types	25,516	11,983	2,525	437	40,461	1,146
Private:							
	Douglas-fir	17,790	12,162	4,049	--	34,001	963
	Ponderosa pine	121,055	16,762	89	4,817	142,723	4,042
	Spruce-subalpine fir	14,292	6,108	--	--	20,400	578
	White fir	9,803	--	759	--	10,562	299
	Engelmann spruce	21,910	14,635	3,489	--	40,034	1,133
	Pinyon-juniper	3,498	1,902	139	350	5,889	167
	Aspen	5,234	8,815	3,798	--	17,847	505
	All types	193,582	60,384	12,323	5,167	271,456	7,687
State and private:							
	Douglas-fir	19,690	14,686	4,782	--	39,158	1,109
	Ponderosa pine	132,582	18,499	109	5,245	156,435	4,430
	Spruce-subalpine fir	17,258	7,376	--	--	24,634	698
	White fir	11,876	--	933	--	12,809	363
	Engelmann spruce	27,772	17,672	4,348	--	49,792	1,410
	Pinyon-juniper	3,600	1,949	172	359	6,080	172
	Aspen	6,320	12,185	4,504	--	23,009	651
	All types	219,098	72,367	14,848	5,604	311,917	8,833

Table 14.--*Net volume of sawtimber on commercial timberland in Colfax County by ownership class, forest type, and stand-size class, 1976*

Ownership class	Forest type	Stand-size class				All classes
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked	
		Thousand board feet[1]				
State:						
	Douglas-fir	6,097	4,371	1,792	--	12,260
	Ponderosa pine	47,556	4,068	63	2,165	53,852
	Spruce-subalpine fir	12,570	1,231	--	--	13,801
	White fir	8,128	--	471	--	8,599
	Engelmann spruce	21,937	6,440	2,986	--	31,363
	Pinyon-juniper	276	203	49	44	572
	Aspen	3,191	3,244	1,070	--	7,505
	All types	99,755	19,557	6,431	2,209	127,952
Private:						
	Douglas-fir	64,106	21,060	10,520	--	95,686
	Ponderosa pine	499,516	36,382	274	24,951	561,123
	Spruce-subalpine fir	60,570	5,932	--	--	66,502
	White fir	38,585	--	2,058	--	40,643
	Engelmann spruce	82,775	31,036	12,129	--	125,940
	Pinyon-juniper	9,615	8,174	204	1,777	19,770
	Aspen	15,377	8,459	6,613	--	30,449
	All types	770,544	111,043	31,798	26,728	940,113
State and private:						
	Douglas-fir	70,203	25,431	12,312	--	107,946
	Ponderosa pine	547,072	40,450	337	27,116	614,975
	Spruce-subalpine fir	73,140	7,163	--	--	80,303
	White fir	46,713	--	2,529	--	49,242
	Engelmann spruce	104,712	37,476	15,115	--	157,303
	Pinyon-juniper	9,891	8,377	253	1,821	20,342
	Aspen	18,568	11,703	7,683	--	37,954
	All types	870,299	130,600	38,229	28,937	1,068,065

[1] International 1/4-inch rule.

Table 15.--*Net volume of growing stock on commercial timberland in Colfax County by species and diameter class; State and private, 1976*

Species	Diameter class (inches at breast height)													
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand cubic feet													
Douglas-fir	4,205	8,082	8,123	5,535	6,856	2,885	3,649	1,025	1,930	1,193	655	--	--	44,138
Ponderosa pine	8,371	20,588	21,241	27,157	25,226	16,847	11,492	7,310	4,647	5,502	--	568	796	149,745
Limber pine	145	530	700	213	--	--	--	--	--	--	--	--	--	1,588
Subalpine fir	3,234	973	2,480	1,758	1,796	165	773	804	249	--	--	--	--	12,232
White fir	1,678	3,541	2,891	4,279	1,734	1,501	2,371	232	588	254	--	--	--	19,069
Engelmann spruce	5,186	7,784	16,992	10,228	5,367	4,873	789	405	1,350	--	--	--	--	52,974
Pinyon/juniper	741	1,204	655	493	749	578	--	--	--	--	--	--	--	4,420
Total softwoods	23,560	42,702	53,082	49,663	41,728	26,849	19,074	9,776	8,764	6,949	655	568	796	284,166
Aspen	3,672	9,554	9,353	2,611	1,835	537	189	--	--	--	--	--	--	27,751
All species	27,232	52,256	62,435	52,274	43,563	27,386	19,263	9,776	8,764	6,949	655	568	796	311,917

Table 16.--*Net volume of sawtimber on commercial timberland in Colfax County by species and diameter class; State and private, 1976*

Species	Diameter class (inches at breast height)													
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	All classes
	Thousand board feet, International 1/4-inch rule											
Douglas-fir	25,409	23,030	32,794	14,700	19,681	5,697	10,953	6,871	3,790	--	--	142,925
Ponderosa pine	75,289	124,211	130,623	93,847	65,776	42,696	27,546	32,987	--	3,474	4,921	601,370
Limber pine	2,395	828	--	--	--	--	--	--	--	--	--	3,223
Subalpine fir	10,616	8,496	9,212	851	3,971	4,126	1,285	--	--	--	--	38,557
White fir	11,560	18,961	7,924	6,799	10,421	969	2,383	1,006	--	--	--	60,023
Engelmann spruce	70,679	50,008	27,581	25,287	4,083	2,093	6,983	--	--	--	--	186,714
Pinyon/juniper	1,965	1,466	2,183	1,643	--	--	--	--	--	--	--	7,257
Total softwoods	197,913	227,000	210,317	143,127	103,932	55,581	49,150	40,864	3,790	3,474	4,921	1,040,069
Aspen	0	13,750	10,177	3,024	1,045	--	--	--	--	--	--	27,996
All species	197,913	240,750	220,494	146,151	104,977	55,581	49,150	40,864	3,790	3,474	4,921	1,068,065

Table 17.--*Net volume of growing stock and sawtimber on commercial timberland in Colfax County by ownership class and species, 1976*

Ownership class	Species								
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/ juniper	Aspen	All species
	GROWING STOCK *Thousand cubic feet*								
State	4,974	13,421	311	2,245	3,235	9,894	305	6,076	40,461
Private	39,164	136,324	1,277	9,987	15,834	43,080	4,115	21,675	271,456
Total	44,138	149,745	1,588	12,232	19,069	52,974	4,420	27,751	311,917
	GROWING STOCK *Thousand cubic meters*								
State	141	380	9	64	92	280	8	172	1,146
Private	1,109	3,860	36	283	448	1,220	117	614	7,687
Total	1,250	4,240	45	347	540	1,500	125	786	8,833
	SAWTIMBER *Thousand board feet, International 1/4-inch rule*								
State	14,252	53,864	641	7,228	10,288	35,486	521	5,672	127,952
Private	128,673	547,506	2,582	31,329	49,735	151,228	6,736	22,324	940,113
Total	142,925	601,370	3,223	38,557	60,023	186,714	7,257	27,996	1,068,065

Table 18.--*Net volume of timber on commercial timberland in Colfax County by class of timber, and softwoods and hardwoods; State and private, 1976*

Class of timber	Softwoods	Hardwoods	All classes
	Thousand cubic feet		
Sawtimber trees:			
Saw-log portion	202,082	4,878	206,960
Upper-stem portion	15,822	294	16,116
Total	217,904	5,172	223,076
Poletimber trees	66,262	22,579	88,841
All growing stock trees	284,166	27,751	311,917
Sound cull trees	18,985	2,267	21,252
Rotten cull trees	1,177	1,143	2,320
Salvable dead trees	6,065	642	6,707
All timber	310,393	31,803	342,196

Table 19.--*Net volume of growing stock on commercial timberland in Colfax County by forest type and species; State and private, 1976*

Forest type	Species									All species	
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/ juniper	Total softwoods	Aspen		
	Thousand cubic feet										*Thousand cubic meters*
Douglas-fir	22,573	5,719	700	--	6,731	--	423	36,146	3,012	39,158	1,109
Ponderosa pine	15,594	137,922	--	--	1,205	--	1,598	156,319	116	156,435	4,430
Spruce-subalpine fir	182	--	--	8,702	--	15,338	--	24,222	412	24,634	698
White fir	1,035	2,214	145	963	7,884	--	--	12,241	568	12,809	363
Engelmann spruce	2,928	--	213	2,567	2,995	34,195	--	42,898	6,894	49,792	1,410
Pinyon-juniper	707	2,974	--	--	--	--	2,399	6,080	--	6,080	172
Aspen	1,119	916	530	--	254	3,441	--	6,260	16,749	23,009	651
All types	44,138	149,745	1,588	12,232	19,069	52,974	4,420	284,166	27,751	311,917	8,833
	Thousand cubic meters										
All types	1,250	4,240	45	347	540	1,500	125	8,047	786	--	8,833

Table 20.--*Net volume of sawtimber on commercial timberland in Colfax County by forest type and species; State and private, 1976*

Forest type	Species									All species
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Pinyon/ juniper	Total softwoods	Aspen	
	Thousand board feet, International 1/4-inch rule									
Douglas-fir	64,130	25,512	2,395	--	14,830	--	1,079	107,946	--	107,946
Ponderosa pine	59,454	549,344	--	--	3,164	--	3,013	614,975	--	614,975
Spruce-subalpine fir	--	--	--	28,206	--	52,097	--	80,303	--	80,303
White fir	3,834	10,486	--	4,032	29,845	--	--	48,197	1,045	49,242
Engelmann spruce	10,119	--	828	6,319	11,178	122,454	--	150,898	6,405	157,303
Pinyon-juniper	2,256	14,921	--	--	--	--	3,165	20,342	--	20,342
Aspen	3,132	1,107	--	--	1,006	12,163	--	17,408	20,546	37,954
All types	142,925	601,370	3,223	38,557	60,023	186,714	7,257	1,040,069	27,996	1,068,065

Table 21.--*Net annual growth of growing stock and sawtimber on commercial timberland in Colfax County, by ownership class and species, 1976*

Ownership class	Species									All species
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Total softwoods	Aspen		
	GROWING STOCK									
	Cubic feet									
State	144,128	287,748	11,066	65,472	79,342	290,632	878,388	176,780		1,055,168
Private	1,042,846	3,176,791	48,407	295,017	392,496	1,423,055	6,378,612	711,012		7,089,624
Total	1,186,974	3,464,539	59,473	360,489	471,838	1,713,687	7,257,000	887,792		8,144,792
	GROWING STOCK									
	Cubic meters									
State	4,081	8,148	313	1,854	2,247	8,230	24,873	5,006		29,879
Private	29,530	89,957	1,371	8,354	11,114	40,296	180,622	20,134		200,756
Total	33,611	98,105	1,684	10,208	13,361	48,526	205,495	25,140		230,635
	SAWTIMBER									
	Board feet, International 1/4-inch rule									
State	444,868	1,177,012	34,260	400,372	180,883	1,716,165	3,953,560	136,002		4,089,562
Private	3,357,022	13,552,331	153,958	1,856,707	910,709	7,413,997	27,244,724	514,230		27,758,954
Total	3,801,890	14,729,343	188,218	2,257,079	1,091,592	9,130,162	31,198,284	650,232		31,848,516

Table 22.--*Annual mortality of growing stock and sawtimber on commercial timberland in Colfax County by ownership class, and softwoods and hardwoods, 1976*

Species group and ownership class	Growing stock		Sawtimber
	- Cubic feet-	*- Cubic meters -*	*- Board feet*[1] *-*
Softwoods:			
State	94,940	2,688	337,535
Private	461,067	13,056	1,657,117
Total	556,007	15,744	1,994,652
Hardwoods:			
State	--	--	--
Private	--	--	--
Total	--	--	--

[1]International 1/4-inch rule.

Table 23.--*Annual mortality of growing stock and sawtimber on commercial timberland in Colfax County by cause of death and species; State and private, 1976*

Cause of death	Species							All species
	Douglas-fir	Ponderosa pine	Limber pine	Subalpine fir	White fir	Engelmann spruce	Aspen	
	GROWING STOCK							
	Cubic feet							
Insects	--	--	--	--	--	--	--	--
Disease	--	--	--	--	--	--	--	--
Fire	32,202	--	--	--	66,083	--	--	98,285
Animal	--	--	--	--	--	--	--	--
Weather	--	--	--	--	--	--	--	--
Suppression	--	--	--	--	--	--	--	--
Unknown	--	288,968	--	--	60,584	--	--	349,552
Logging	--	108,170	--	--	--	--	--	108,170
Total	32,202	397,138	--	--	126,667	--	--	556,007
	GROWING STOCK							
	Cubic meters							
Insects	--	--	--	--	--	--	--	--
Disease	--	--	--	--	--	--	--	--
Fire	912	--	--	--	1,871	--	--	2,783
Animal	--	--	--	--	--	--	--	--
Weather	--	--	--	--	--	--	--	--
Suppression	--	--	--	--	--	--	--	--
Unknown	--	8,182	--	--	1,716	--	--	9,898
Logging	--	3,063	--	--	--	--	--	3,063
Total	912	11,245	--	--	3,587	--	--	15,744
	SAWTIMBER							
	Board feet, International 1/4-inch rule							
Insects	--	--	--	--	--	--	--	--
Disease	--	--	--	--	--	--	--	--
Fire	--	--	--	--	290,620	--	--	290,620
Animal	--	--	--	--	--	--	--	--
Weather	--	--	--	--	--	--	--	--
Suppression	--	--	--	--	--	--	--	--
Unknown	--	1,430,770	--	--	273,262	--	--	1,704,032
Logging	--	--	--	--	--	--	--	--
Total	--	1,430,770	--	--	563,882	--	--	1,994,652

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Barrett, Michael K., and Dorothy G. Shupe
1980. Forest area and timber resource statistics for Colfax County, New Mexico, 1976. USDA For. Serv. Resour. Bull. INT-18, 23 p. Intermt. For. and Range Exp. Stn. Ogden, Utah 84401.

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

KEYWORDS: forest surveys (regional), forest area classification, stand volume.

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The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

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WYOMING TIMBER PRODUCTION AND MILL RESIDUES - 1976

CHARLES E. KEEGAN III
RANDLE V. WHITE
THEODORE S. SETZER

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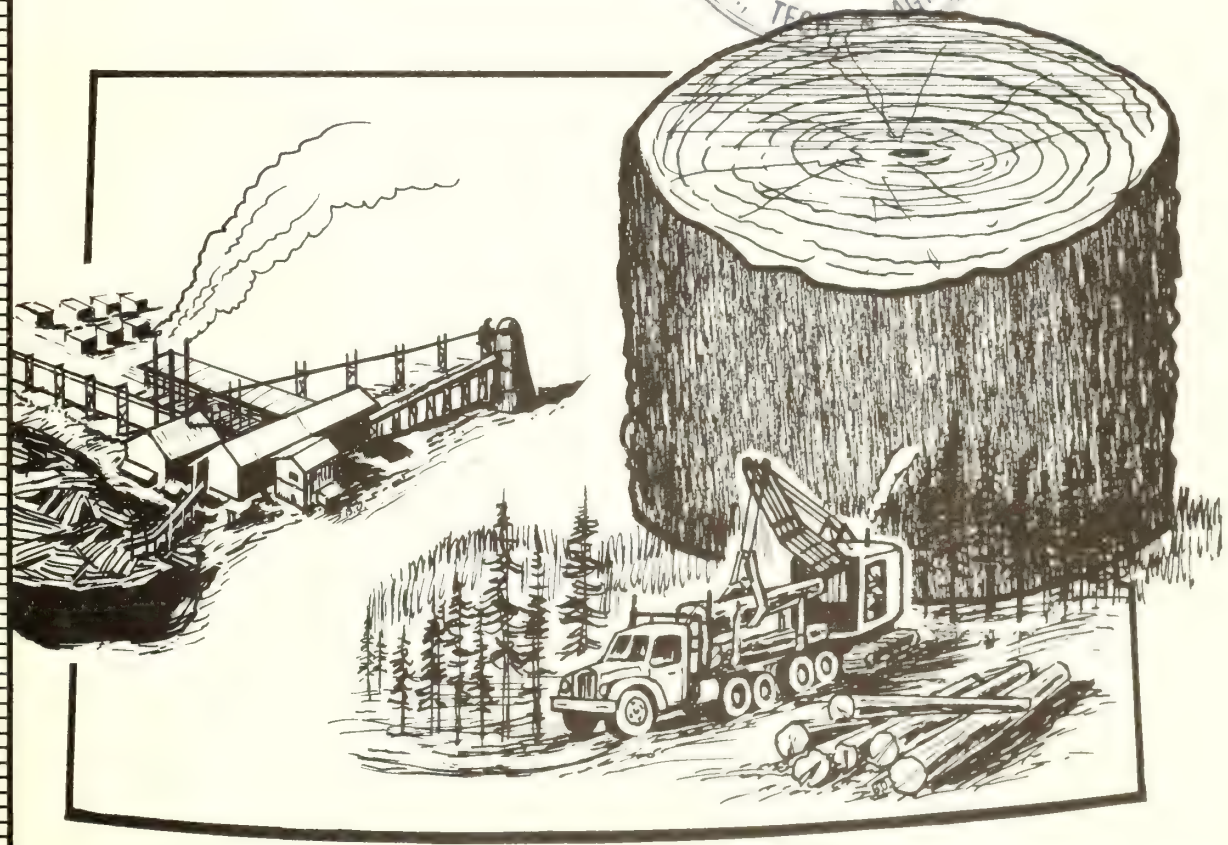

USDA Forest Service Resource Bulletin INT-19
INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE

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WYOMING TIMBER PRODUCTION AND MILL RESIDUES, 1976

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NOTE: The term "timber production" as used in this publication is defined as the production of roundwood timber products.

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Forest Service
U.S. Department of Agriculture
Ogden, Utah 84401

RESEARCH SUMMARY

Wyoming roundwood timber production in 1976 was 25,756 thousand cubic feet (729.3 thousand cubic meters) compared to 30,048 thousand cubic feet (850.9 thousand cubic meters) in 1969. Sawlog output was down from the 1969 estimate of 167,620 thousand board feet to 135,648 thousand board feet in 1976. Estimated volume of plant residues (including bark) from Wyoming's lumber industry was 21,654 thousand cubic feet (613.2 thousand cubic meters) of which 10,521 thousand cubic feet (297.9 thousand cubic meters) were utilized.

The data presented in this study are based on the Wyoming Forest Industries Data Collection System, a cooperative survey performed by the Bureau of Business and Economic Research, University of Montana, Missoula, Montana; coordinated and funded by the Renewable Resources Evaluation Research Unit of the Intermountain Forest and Range Experiment Station.

Wyoming's estimated 1976 production of roundwood timber products[1] was 25,756 thousand cubic feet (729.3 thousand cubic meters), 14 percent less than the 1969 estimate of 30,048 thousand cubic feet (850.9 thousand cubic meters)(fig. 1).[2]

Sawlog output decreased to 23,591 thousand cubic feet (668.0 thousand cubic meters; 135,648 thousand board feet) from the 1969 estimate of 29,287 thousand cubic feet (829.3 thousand cubic meters; 167,620 thousand board feet).[3] The volume of sawlogs was 5,696 thousand cubic feet (161.3 thousand cubic meters) less than the 1969 level and accounted for about 92 percent of the State's total roundwood products production in 1976; the comparable percentage for 1969 was 97.5. The roundwood pulpwood harvest was 1,668 thousand cubic feet (47.2 thousand cubic meters) in 1976 in contrast to 1969 when no roundwood pulpwood harvest was reported in Wyoming. Production of all other roundwood products combined was 497 thousand cubic feet (14.1 thousand cubic meters), down from the 1969 estimate of 761 thousand cubic feet (21.5 thousand cubic meters) (table 1).[4]

A limited number of firms purchased timber within most counties in Wyoming. Confidential information about the operations of individual firms must be protected; therefore, sawlog harvest data can be released only on a regional basis, with some discussion of the changes in level of harvest on a county by county basis within regions.

The State of Wyoming has been divided by county into three regions:

Region A	Region B	Region C
Fremont	Big Horn	Albany
Hot Springs	Campbell	Carbon
Lincoln	Crook	Converse
Park	Johnson	Goshen
Sublette	Sheridan	Laramie
Sweetwater	Washakie	Natrona
Teton	Weston	Niobrara
Uinta		Platte

Region A, made up of the western counties, shows a 42.5 million board foot decrease in sawlog harvest, from almost 94 million board feet in 1969 to just over 51 million board feet in 1976 (table 2). Fremont, Lincoln, Hot Springs, Uinta, and Park Counties showed a combined total harvest that was less than one-fifth of the harvest for those same counties in 1969. Sublette and Teton Counties both had significant increases in sawlog production from 1969 to 1976, but the magnitude of these increases was not sufficient to offset the large reductions in the other counties.

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[1]Logs, bolts, or other round sections cut from trees for industrial or consumer use. Such products include sawlogs, pulpwood, fuelwood, piling, poles, hewn ties, mine timbers, and various other round, split, or hewn products.

[2]The 1969 figures used in this report are taken from Setzer, Theodore S. 1971. Estimates of timber products output and plant residues, Wyoming and western South Dakota, 1969. USDA For. Serv. Res. Note INT-136, 6 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

[3]Unless otherwise indicated, Scribner log rule is used throughout this report for board foot volumes of roundwood products.

[4]Other roundwood products include commercial poles, pilings, posts, and house logs.

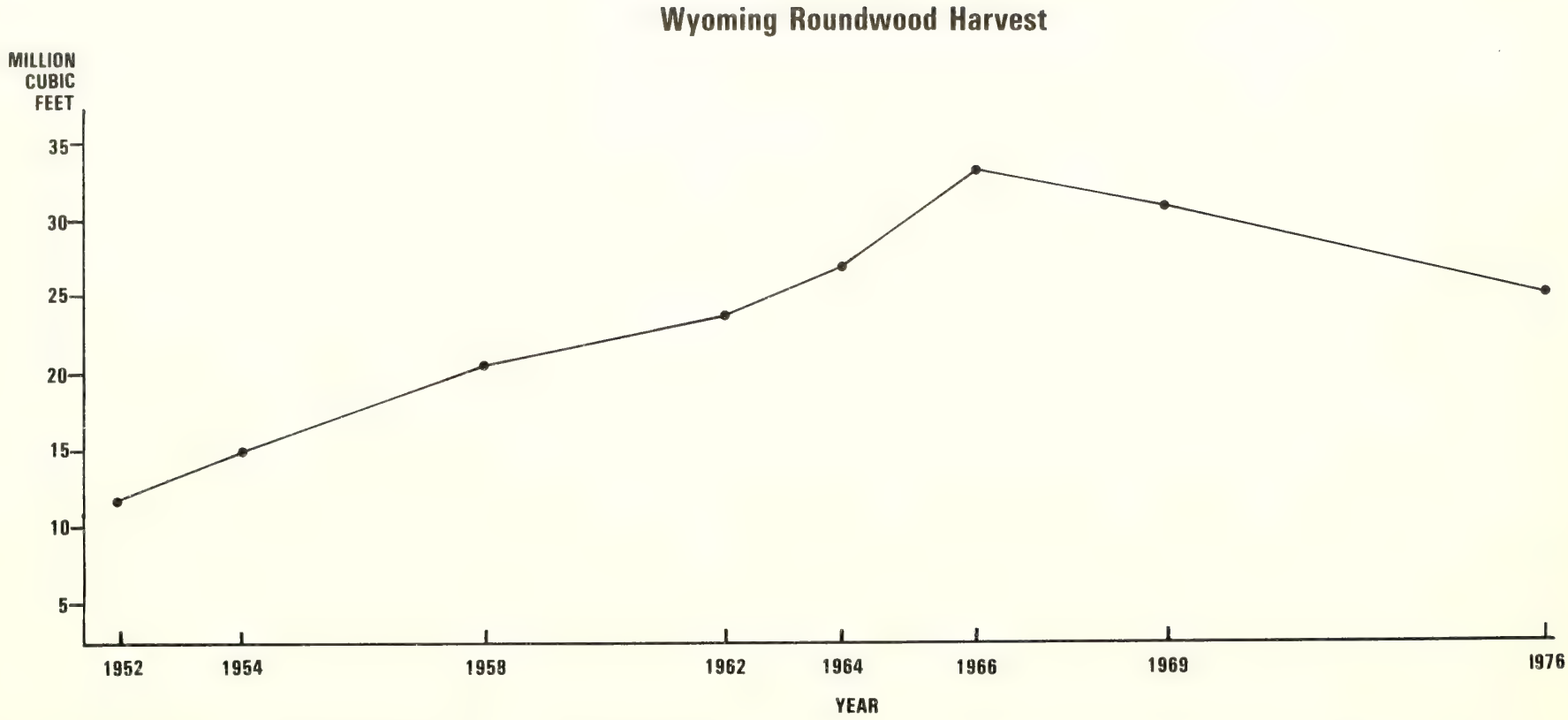

Figure 1.--Roundwood harvest, 1952 through 1976. Plotted volumes through 1969 from Setzer (1971).

Table 1.--*Roundwood products from Wyoming timberlands by species, 1976*

Product	Species						All species	
	Subalpine fir	Englemann spruce	Lodgepole pine	Ponderosa pine	Douglas-fir	Other species	Volume	Percent
	Thousand cubic feet							
Sawlogs	1,084	2,563	12,546	6,000	1,323	75	23,591	91.6
Roundwood pulpwood	--	--	--	1,668	--	--	1,668	6.5
Other roundwood products[1]	5	7	343	109	32	1	497	1.9
Total	1,089	2,570	12,889	7,777	1,355	76	25,756	100.0
Percent of total	4.2	10.0	50.0	30.2	5.3	.3	100.0	
	Thousand cubic meters							
Sawlogs	30.7	72.6	355.2	169.9	37.5	2.1	668.0	91.6
Roundwood pulpwood	--	--	--	47.2	--	--	47.2	6.5
Other roundwood products[1]	.1	.2	9.8	3.1	.9	([2])	14.1	1.9
Total	30.8	72.8	365.0	220.2	38.4	2.1	729.3	100.0
Percent of total	4.2	10.0	50.0	30.2	5.3	.3	100.0	

[1] Includes commercial poles, pilings, posts, and house logs.
[2] Less than 50 cubic meters.

Table 2.--*Mill receipts of sawlogs from Wyoming timberlands by species and geographic origin, 1976*

Region	Species						All species	
	Subalpine fir	Englemann spruce	Lodgepole pine	Ponderosa pine	Douglas-fir	Other species	Volume	Percent
	Thousand board feet, Scribner							
Region A	2,568	7,421	34,494	190	6,379	120	51,172	37.7
Region B	558	3,546	8,591	34,060	1,232	16	48,003	35.4
Region C	3,108	3,764	29,052	254	--	295	36,473	26.9
Total	6,234	14,731	72,137	34,504	7,611	431	135,648	100.0
Percent of total	4.6	10.9	53.2	25.4	5.6	.3	100.0	
	Thousand board feet, International 1/4-inch rule							
Region A	2,876	8,312	38,633	213	7,144	134	57,312	37.7
Region B	625	3,972	9,622	38,147	1,380	18	53,764	35.4
Region C	3,481	4,216	32,538	284	--	330	40,849	26.9
Total	6,982	16,500	80,793	38,644	8,524	482	151,925	100.0
Percent of total	4.6	10.9	53.2	25.4	5.6	.3	100.0	

Region B, which includes the north-central and northeastern counties, shows an increased harvest of 6.5 million board feet, from 41.5 million board feet in 1969 to 48 million board feet in 1976. This gain is due to a large increase from the ponderosa pine lands in Crook and Weston Counties in northeastern Wyoming. The increased cut on these lands more than offset a reduction in harvest of over 50 percent in Johnson and Sheridan Counties from 1969 to 1976.

Sawlog production from timberlands in Region C in 1976 was 36 million board feet, 4 million board feet more than in 1969. The major timber-producing counties in this region, Albany and Carbon, both showed increased harvests in 1976.

Lodgepole pine, ponderosa pine, and Engelmann spruce were the predominant timber species harvested from Wyoming timberlands, accounting for over 90 percent of the 1976 harvest. The remainder of the cut was composed mainly of Douglas-fir and subalpine fir, with cottonwood, limber pine, and juniper making up less than 1 percent of the harvest (table 2).

In 1976, approximately 78 percent of the volume of coarse residues and 35 percent of the fine residues were utilized as compared to 1969 when 58 percent of the coarse residues and 29 percent of the fine residues were used (table 3).[5] Utilization of bark approached 12 percent in 1976. In 1969, there was almost no utilization of bark.

Table 3.--*Estimated volume of used and unused sawmill residues in Wyoming by type, 1969 and 1976*

Type and year	Estimated volume			Percent of total		
	Used	Unused	Total	Used	Unused	Total
	Thousand cubic feet			*Percent*		
Bark:						
1969	3	4,683	4,686	0.1	99.9	100.0
1976	552	4,185	4,737	11.7	88.3	100.0
Coarse:[1]						
1969	4,262	3,060	7,322	58.2	41.8	100.0
1976	7,377	2,109	9,486	77.8	22.2	100.0
Fine:[2]						
1969	2,269	5,638	7,907	28.7	71.3	100.0
1976	2,592	4,839	7,431	34.9	65.1	100.0
	Thousand cubic meters			*Percent*		
Bark:						
1969	0.1	132.6	132.7	0.1	99.9	100.0
1976	15.6	118.5	134.1	11.7	88.3	100.0
Coarse:[1]						
1969	120.7	86.6	207.3	58.2	41.8	100.0
1976	208.9	59.7	268.6	77.8	22.2	100.0
Fine:[2]						
1969	64.3	159.6	223.9	28.7	71.3	100.0
1976	73.4	137.0	210.4	34.9	65.1	100.0

[1]Material suitable for chipping, such as slabs, edgings, and trimmings.
[2]Such material as sawdust and shavings.

[5]Mill residues are wood materials from manufacturing plants not utilized for the mill's primary product. Such materials include bark, slabs, edgings, trimmings, miscuts, sawdust, and shavings.

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This report presents data on timber production and mill residues for the State of Wyoming. Also included are historical trends in roundwood harvest since 1952, and comparisons of 1976 product output, mill residues and residue use with 1969 estimates. Data are presented for three Regions, made up of county groupings, in addition to the State total.

KEYWORDS: primary wood products, sawtimber, pulpwood, sawmill residues use.

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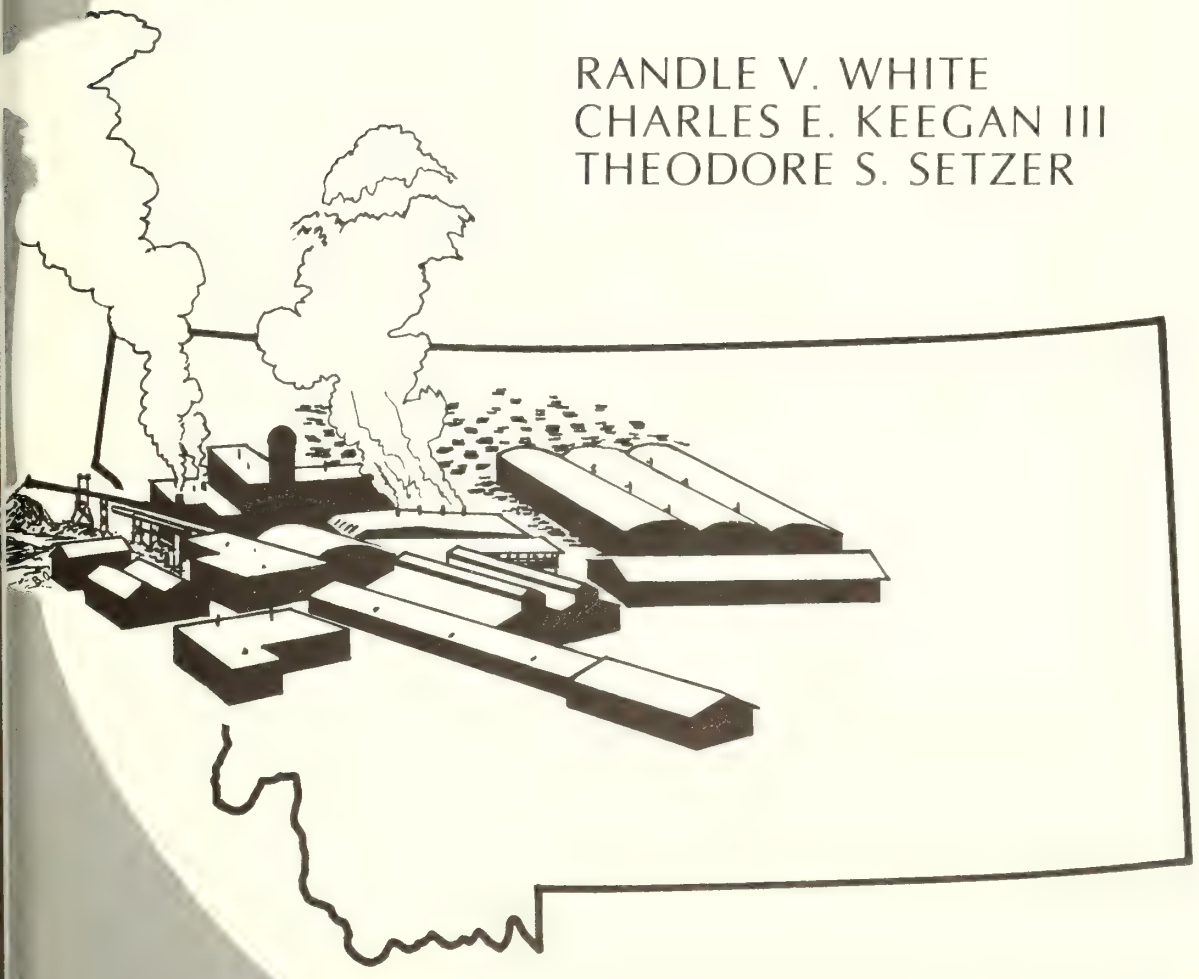
MONTANA TIMBER PRODUCTION AND MILL RESIDUES, 1976

RANDLE V. WHITE
CHARLES E. KEEGAN III
THEODORE S. SETZER



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MONTANA TIMBER PRODUCTION AND MILL RESIDUES, 1976

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Ogden, Utah 84401

SUMMARY

This report shows that Montana roundwood timber production declined from 245,948 thousand cubic feet (6 964.5 thousand cubic meters) in 1969 to 202,362 thousand cubic feet (5 730.3 thousand cubic meters) in 1976. Saw log production decreased from 211,174 thousand cubic feet (5 979.8 thousand cubic meters) in 1969 to 149,636 thousand cubic feet (4 237.2 thousand cubic meters) in 1976. Veneer log output increased to 44,511 thousand cubic feet (1 260.4 thousand cubic meters) as compared to 28,574 thousand cubic feet (809.1 thousand cubic meters) in 1969. The round pulpwood production of 2,380 thousand cubic feet (67.4 thousand cubic meters) was up from the 1,682 thousand cubic feet (47.6 thousand cubic meters) in 1969. Estimated volume of plant residues (including bark) from the lumber, and veneer and plywood industries was 126,744 thousand cubic feet (3 589.0 thousand cubic meters). Of this volume, 87 percent (110,000 thousand cubic feet, 3 114.8 thousand cubic meters) was used.

ACKNOWLEDGMENT

We appreciate the cooperation of the owners and operators of Montana's primary wood-using industries in supplying data for this report.

The data presented in this study are based on the Montana Forest Industries Data Collection System, a cooperative survey performed by the Bureau of Business and Economic Research, University of Montana, Missoula, Montana; funded by various United States Forest Service offices; and coordinated by the Intermountain Forest and Range Experiment Station, Ogden, Utah.

INTRODUCTION

In 1976, production of roundwood timber products in Montana was 202,362 thousand cubic feet (5 730.3 thousand cubic meters) (fig. 1). This represents a decline of 18 percent from the 1969 harvest of 245,948 thousand cubic feet (6 964.5 thousand cubic meters).[1]

Saw logs remained the principal roundwood product from Montana timberlands accounting for about 74 percent of the 1976 total harvest (table 1). The 1976 saw log output of 149,636 thousand cubic feet (4 237.2 thousand cubic meters; 860,415 thousand board feet) was 348,230 thousand board feet below the 1969 saw log harvest--a drop of 29 percent.[2] The decline in saw log output, however, was offset in part by an increase in veneer logs harvested from 28,574 thousand cubic feet (809.1 thousand cubic meters; 168,015 thousand board feet) in 1969 to 44,511 thousand cubic feet (1 260.4 thousand cubic meters; 261,724 thousand board feet) in 1976, with veneer logs now constituting 22 percent of the total output of roundwood products.[3]

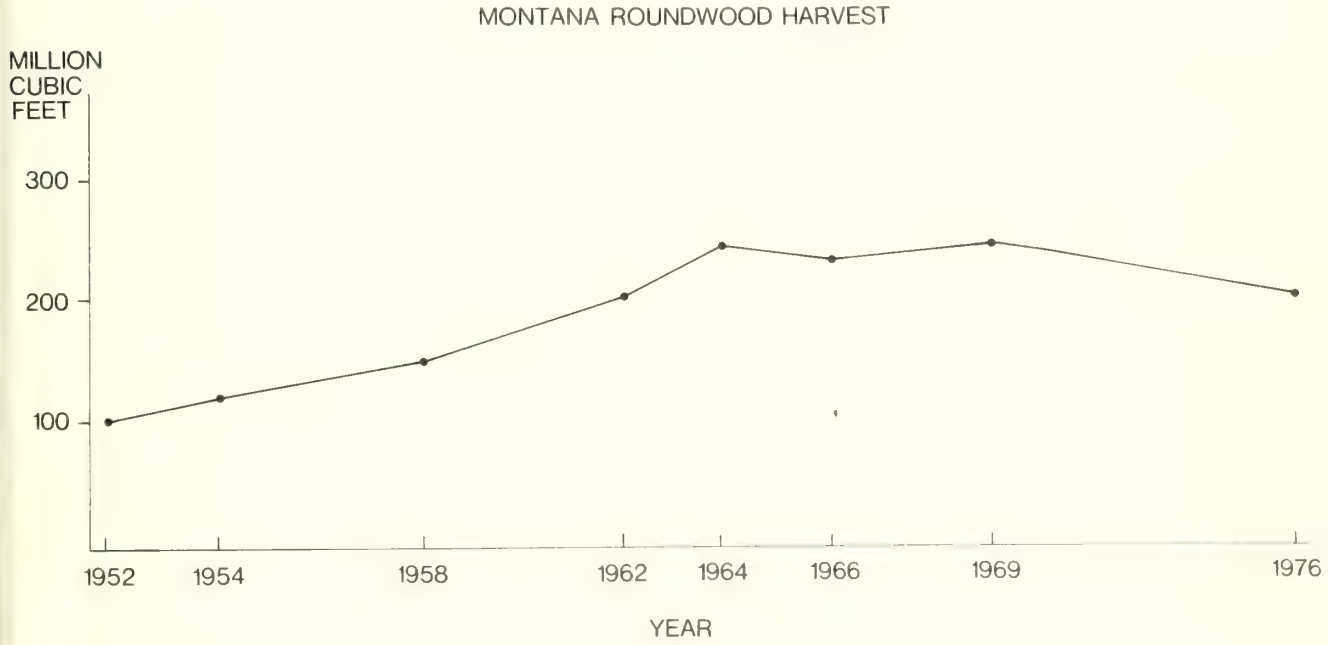

Figure 1.--Roundwood harvest, 1952 through 1976. Plotted volumes through 1969 are from Setzer (1971).

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[1]The 1969 figures used in this report are taken from Setzer, Theodore S. 1971. Estimates of timber products output and plant residues, Montana, 1969. USDA For. Serv. Res. Note INT-133, 4 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

[2]Unless otherwise indicated, Scribner log rule is used throughout this report for board foot volumes of roundwood products.

[3]Logs, bolts, or other round sections cut from trees for industrial or consumer uses. Roundwood products include saw logs, pulpwood, fuelwood, piling, poles, hewn ties, mine timbers, and various other round, split, or hewn products.

Table 1.--*Roundwood products from Montana timberlands by species, 1970*

Product	Species											All species	
	Douglas-fir	Engelmann spruce	Lodgepole pine	Ponderosa pine	True firs[1]	Western larch	Western hemlock	Western redcedar	Western white pine	Other	Unknown	Volume	Percent
	Thousand cubic feet												
Saw logs	39,436	11,546	35,470	22,505	7,816	24,216	991	2,324	4,890	59	383	149,636	73.9
Veneer logs	14,087	3,483	2,027	7,146	2,169	15,523	--	--	--	76	--	44,511	22.0
Pulpwood	2	1	3	--	--	3	27	--	49	2	2,293	2,380	1.2
Miscellaneous industrial wood[2]	22	40	3,186	--	2	11	--	808	23	--	--	4,092	2.0
Posts, poles, fuelwood, miscellaneous farm timbers	52	3	1,563	50	3	56	--	16	--	--	--	1,743	.9
Total	53,599	15,073	42,249	29,701	9,990	39,809	1,018	3,148	4,962	137	2,676	202,362	100.0
Percent of total	26.5	7.4	20.9	14.7	4.9	19.7	.5	1.6	2.4	.1	1.3	100.0	
	Thousand cubic meters												
Saw logs	1 116.7	327.0	1 004.4	637.3	221.3	685.7	28.1	65.8	138.4	1.7	10.8	4 237.2	73.9
Veneer logs	398.9	98.6	57.4	202.4	61.4	439.6	--	--	--	2.1	--	1 260.4	22.0
Pulpwood	.1	([3])	.1	--	--	.1	.7	--	1.4	.1	64.9	67.4	1.2
Miscellaneous industrial wood[2]	.6	1.1	90.2	--	.1	.3	--	22.9	.7	--	--	115.9	2.0
Posts, poles, fuelwood, miscellaneous farm timbers	1.5	.1	44.2	1.4	.1	1.6	--	.5	--	--	--	49.4	.9
Total	1 517.8	426.8	1 196.3	841.1	282.9	1 127.3	28.8	89.2	140.5	3.9	75.7	5 730.3	100.0
Percent of total	26.5	7.4	20.9	14.7	4.9	19.7	.5	1.6	2.4	.1	1.3	100.0	

[1]Includes grand, white, and subalpine firs.
[2]Includes house logs and cedar specialties.
[3]Less than 50 cubic meters.

Round pulpwood output increased from 1,682 thousand cubic feet (47.6 thousand cubic meters) in 1969 to 2,380 thousand cubic feet (67.4 thousand cubic meters) in 1976. Output of all other roundwood products (such as, fuelwood, house logs, cedar specialties, and miscellaneous farm timbers) was 5,835 thousand cubic feet (165.3 thousand cubic meters). Round pulpwood and other products have become a more important component of the harvest, accounting for over 4 percent of the total in 1976 as compared to only about 2.5 percent in 1969. The substantial percent change can be attributed to both the sharp decline in sawtimber harvest since 1969 and a concurrent increase in the harvest of other roundwood products, due primarily to the development of the house log industry in Montana and to increases in round pulpwood harvest.

Over 26 percent of the mill receipts of saw logs from Montana timberlands in 1976 was Douglas-fir (table 2 and 3). Mill receipts of Lodgepole pine amounted to more than 23 percent of the State's total with mill receipts of western larch making up over 16 percent; of ponderosa pine about 15 percent; of Engelmann spruce less than 8 percent; of true firs, western white pine, western redcedar, and western hemlock almost 11 percent; and of other species less than 0.5 percent.

Lincoln County supplied 217,000 thousand board feet of saw logs (25.2 percent of the total output) to lead the State in 1976. The saw log harvest in 1976, however, was less than half the reported harvest of 467,000 thousand board feet for Lincoln County in 1969. Flathead County remained the second leading supplier of saw logs with output of 154,000 thousand board feet or 17.9 percent of the total; this volume is over 60,000 thousand board feet below the 1969 harvest in Flathead County. Sanders County produced 107,741 thousand board feet, or 12.5 percent of the State's total, to become the third ranking county in saw log output, replacing Missoula County and its total harvest of 97,000 thousand board feet.

In 1976, approximately 95 percent of the volume of coarse residues and 83 percent of the fine residues were utilized as compared to about 87 percent of the coarse and 60 percent of the fine residues that were used in 1969 (table 4).[4] Utilization of bark increased from 28 percent in 1969 to over 77 percent in 1976. This rise was due primarily to a greater use of bark as an industrial fuel by wood products manufacturers in Montana.

[4]Mill residue consists of wood materials from manufacturing plants not utilized for the mill's primary product. Such materials include bark, slabs, edgings, trimmings, miscuts, sawdust, and shavings.

Table 2.--*Mill receipts of saw logs from Montana timberlands by species and county of origin, 1976*

County	Species											All species	
	Douglas-fir	Engelmann spruce	Lodgepole pine	Ponderosa pine	True firs[1]	Western larch	Western hemlock	Western redcedar	Western white pine	Other	Unknown	Volume	Percent
	Thousand board feet, International 1/4-inch rule												
Beaverhead	5,739	541	10,268	1,747	112	(2)	0	(2)	0	0	0	18,565	1.9
Big Horn	0	0	0	(2)	0	0	0	0	0	0	0	(2)	(2)
Broadwater	1,902	43	2,246	129	0	0	0	0	0	0	0	4,320	.4
Deer Lodge	(2)	0	(2)	0	0	0	0	0	0	0	0	(2)	(2)
Fergus	186	12	0	1,599	0	0	0	0	0	0	0	1,797	.2
Flathead	35,667	23,082	42,828	18,076	8,438	33,377	7	1,441	7,133	7	2,464	172,520	17.9
Gallatin	6,289	4,432	21,028	0	0	0	0	0	0	67	0	31,816	3.3
Glacier	(2)	(2)	(2)	(2)	(2)	(2)	0	(2)	(2)	0	0	(2)	(2)
Granite	6,222	447	3,660	2,611	(2)	2,065	0	0	(2)	0	0	15,543	1.6
Jefferson	5,518	102	7,519	308	0	0	0	0	0	0	0	13,447	1.4
Judith Basin	(2)	0	(2)	(2)	0	0	0	0	0	0	0	(2)	(2)
Lake	8,855	4,095	4,501	4,146	2,335	7,292	0	310	1,635	0	0	33,169	3.4
Lewis and Clark	10,201	492	6,240	6,362	243	921	0	0	27	0	0	24,486	2.5
Lincoln	43,264	17,599	48,401	37,564	20,444	50,320	5,570	9,119	10,539	300	0	243,120	25.2
Madison	922	59	1,559	0	0	0	0	0	0	0	0	2,540	.3
Meagher	8,299	(2)	9,782	(2)	0	0	0	0	0	0	0	18,506	1.9
Mineral	10,928	4,234	3,796	11,240	4,458	8,120	564	978	3,605	1	0	47,924	5.0
Missoula	34,213	9,228	12,912	20,283	5,839	23,150	0	335	2,601	0	0	108,561	11.3
Park	11,008	1,407	8,649	0	0	0	0	0	0	0	0	21,064	2.2
Powder River	0	0	0	(2)	0	0	0	0	0	0	0	(2)	(2)
Powell	12,055	1,656	14,074	4,367	889	4,005	0	0	60	0	0	37,106	3.9
Ravalli	12,916	782	6,810	9,416	491	393	0	(2)	(2)	0	0	31,345	3.3
Rosebud	0	0	0	(2)	0	0	0	0	0	0	0	(2)	(2)
Sanders	35,066	5,298	14,659	25,801	6,754	25,254	246	2,093	5,495	4	0	120,670	12.5
Silver Bow	1,552	196	4,940	0	0	0	0	0	0	0	0	6,688	.7
Total	253,970	74,357	228,427	144,935	50,333	155,954	6,387	14,969	31,490	379	2,464	963,665	100.0
Percent of total	26.4	7.7	23.7	15.0	5.2	16.2	.7	1.5	3.3	(3)	(3)	100.0	

[1]Includes grand, white, and subalpine firs.
[2]Data withheld to prevent disclosure of information about individual firms.
[3]Less than 0.05 percent.

Table 3.--*Mill receipts of saw logs from Montana timberlands by species and county of origin, 1976*

County	Species											All species	
	Douglas-fir	Engelmann spruce	Lodgepole pine	Ponderosa pine	True firs[1]	Western larch	Western hemlock	Western redcedar	Western white pine	Other	Unknown	Volume	Percent
	Thousand board feet, Scribner												
Beaverhead	5,124	483	9,168	1,560	100	(2)	0	(2)	0	0	0	16,576	1.9
Big Horn	0	0	0	(2)	0	0	0	0	0	0	0	(2)	(3)
Broadwater	1,698	38	2,005	115	0	0	0	0	0	0	0	3,856	.4
Deer Lodge	(2)	0	(2)	0	0	0	0	0	0	0	0	(2)	(3)
Fergus	166	11	0	1,428	0	0	0	0	0	0	0	1,605	.2
Flathead	31,846	20,609	38,239	16,139	7,534	29,801	6	1,287	6,369	6	2,200	154,036	17.9
Gallatin	5,615	3,957	18,773	0	0	0	0	0	0	60	0	28,405	3.3
Glacier	(2)	(2)	(2)	(2)	(2)	(2)	0	(2)	(2)	0	0	(2)	(3)
Granite	5,555	399	3,268	2,331	(2)	1,844	0	0	(2)	0	0	13,699	1.6
Jefferson	1,927	91	6,713	275	0	0	0	0	0	0	0	12,006	1.4
Judith Basin	(2)	0	(2)	(2)	0	0	0	0	0	0	0	(2)	(3)
Lake	7,906	3,656	4,019	3,702	2,085	6,511	0	277	1,460	0	0	29,616	3.4
Lewis and Clark	9,108	439	5,571	5,680	217	822	0	0	24	0	0	21,861	2.5
Lincoln	38,629	15,713	43,215	33,539	18,254	44,929	4,973	8,142	9,410	268	0	217,072	25.2
Madison	823	53	1,392	0	0	0	0	0	0	0	0	2,268	.3
Meagher	7,410	(2)	8,734	(2)	0	0	0	0	0	0	0	16,523	1.9
Mineral	9,757	3,780	3,389	10,036	3,980	7,250	504	873	3,219	1	0	42,789	5.0
Missoula	30,547	8,239	11,529	18,110	5,213	20,670	0	299	2,322	0	0	96,929	11.3
Park	9,830	1,256	7,722	0	0	0	0	0	0	0	0	18,808	2.2
Powder River	0	0	0	(2)	0	0	0	0	0	0	0	(2)	(3)
Powell	10,763	1,479	12,566	3,899	794	3,576	0	0	54	0	0	35,131	3.9
Ravalli	11,552	698	6,080	8,407	438	351	0	(2)	(2)	0	0	27,987	3.3
Rosebud	0	0	0	(2)	0	0	0	0	0	0	0	(2)	(3)
Sanders	31,309	4,730	13,088	23,037	6,030	22,548	220	1,869	4,906	4	0	107,741	12.5
Silver Bow	1,386	175	4,411	0	0	0	0	0	0	0	0	5,972	.7
Total	226,758	66,390	203,953	129,406	44,940	139,245	5,703	13,365	28,116	339	2,200	860,415	100.0
Percent of total	26.4	7.7	23.7	15.0	5.2	16.2	.7	1.5	3.3	(3)	(3)	100.0	

[1]Includes grand, white, and subalpine firs.
[2]Data withheld to prevent disclosure of information about individual firms.
[3]Less than 0.05 percent.

Table 4.--*Estimated volume of used and unused plant residues from the lumber and veneer and plywood industries in Montana, 1976*

Year	Bark			Coarse[1]			Fine[2]		
	Used	Unused	Total	Used	Unused	Total	Used	Unused	Total
	Thousand cubic feet								
1969	10,552	27,361	37,913	53,075	8,227	61,302	34,152	22,863	57,015
1976	24,764	7,199	31,963	50,666	2,464	53,130	34,570	7,081	41,651
	Thousand cubic meters								
1969	298.8	774.8	1 073.6	1 502.9	233.0	1 735.9	967.1	647.4	1 614.5
1976	701.2	203.9	905.1	1 434.7	69.8	1 504.5	978.9	200.5	1 179.4

[1]Material suitable for chipping; such as slabs, edgings, and trimmings.
[2]Material such as sawdust and shavings.

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The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

The Intermountain Station includes the States of Montana, Idaho, Utah, Nevada, and western Wyoming. About 273 million acres, or 85 percent, of the land area in the Station territory are classified as forest and rangeland. These lands include grasslands, deserts, shrublands, alpine areas, and well-stocked forests. They supply fiber for forest industries; minerals for energy and industrial development; and water for domestic and industrial consumption. They also provide recreation opportunities for millions of visitors each year.

Field programs and research work units of the Station are maintained in:

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